THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
251 Causeway Street, Suite 800, Boston, MA 02114-2136
(617) 626-1200 FAX: (617) 626-1240

Dear Reader:

I invite you to review and submit comments to the Commonwealth's Draft Coastal Assessment and Strategy. State Coastal Zone Management Programs are required to review progress every five years, and update and develop new strategies as appropriate to the National Oceanic and Atmospheric Administration (NOAA). In return, NOAA reviews the Assessment and Strategy for probable grant funding to states to enhance management efforts in the following program areas: Wetlands, Public Access, Coastal Hazards, Cumulative and Secondary Impacts, Energy and Government Facility Siting, Marine Debris, Ocean Resources, Special Area Management, and Aquaculture.

CZM will host a public meeting to solicit oral and written comments on its Draft Coastal Assessment and Strategy on February 28, 2006 from 1 p.m. to 3 p.m. in the Atrium of 251 Causeway Street, Boston. Prior to this date, written comments may be emailed to czm@state.ma.us or mailed to CZM, Attention: Sarah Joor, 251 Causeway Street, Suite 800, Boston, MA 02114.

As with past public review of our Draft Coastal Assessment and Strategy, I expect your comments will assist CZM in the decision-making process and improve strategic planning for these programs.

Sincerely,

Susan Snow-Cotter

DRAFT
Massachusetts Office of Coastal Zone Management
NOAA §309 Assessment – 2006

Massachusetts §309 Summary Matrix

Issue	Priority	Projects	Budget	Page
Public Access	Medium	-Coastwalking on the Web	$80K (1 yr)	3
		-Complete Statewide Inventory of Coastal Accessways	$125K (1 yr)	
		-Seapath Evaluation Methodology	$75K/yr (2 yrs)	
Coastal Hazards	High	-Provide Technical Support to FEMA for Primary Frontal Dune Mapping	$15K/yr (2 yrs)	13
		- Coastal Hazards Toolbox	$430K (over 5 yrs)	
Wetlands	High	-Institutionalize Wetlands Restoration Program (WRP)	$40,656 (1 yr)	21
		- Addition and Integration of Eelgrass Habitat Restoration to WRP	$78K (3-5 yrs)	
		- Continue WRP-related Research on Assessment Tools and Trends	$42,450/yr for 3 yrs; $60K one time cost	
Ocean Resources	High	-Habitat and Endangered Species Program Policies	$150K (over 5 yrs)	33
		-Characterization of Human Uses in State Waters: Regional Assessment	$385K (over 5 yrs)	
		-Habitat Classification Pilot Project	$375K	

		-Interpreting Seafloor Maps -Enhanced Implementation of the Massachusetts Ocean Sanctuaries Act - Regional Ocean Governance (Continuation of Efforts)	(over 5 yrs) $350K (over 5 years) $200K (over 5 yrs) $75K (over 5 yrs)	
Special Area Manage-ment Planning	Medium	-ACEC Stewardship Activities (existing staff time) -DPA Program Guidance	None $50K	47
Energy and Government Siting	Medium	-Energy Need and Implications for the MA Coast -Clarifications to CZM Energy Policy #1	$84K $45K (over 2 yrs)	54
Cumulative and Secondary Impacts	High	-Establish LID/BMP Clearinghouse Website -Technical Guidance for Development/ Implementation of Stormwater Utilities	$70K (over 2 yrs) $80K (over 2 yrs)	60
Aquaculture	Low	None specified.		72
Marine Debris	Low	None specified.		76

Programmatic Objectives

I. *Improve public access through regulatory, statutory, and legal systems.*
II. *Acquire, improve, and maintain public access sites to meet current and future demand through the use of innovative funding and acquisition techniques.*
III. *Develop or enhance a Coastal Public Access Management Plan which takes into account the provision of public access to all users of coastal areas of recreational, historical, aesthetic, ecological, and cultural value.*
IV. *Minimize potential adverse impacts of public access on coastal resources and private property rights through appropriate protection measures Improve public access through regulatory, statutory, and legal systems.*

Resource Characterization

1. Describe the current status of public access in Massachusetts.

Public access to the shoreline has been a focal point for coastal zone management in Massachusetts for three decades, with the primary strategy being the traditional one of direct land acquisition. In the 70s and 80s in particular, a total of nearly $60 million in state funds was expended to purchase a considerable number of sandy beaches and other natural areas for park purposes. Together with similar acquisition efforts by the federal government, municipalities, and non-profit conservation organizations, this state spending program brought nearly 100 additional miles of tidal shoreline into public or quasi-public ownership. As a result, an estimated 375 miles (approximately 25% of our total coastal frontage) is now in the "public estate", and more is being bought as additional funding becomes available. One new source is NOAA's Coastal and Estuarine Land Conservation Program (CELP), under which Massachusetts has developed a comprehensive plan that identifies priority candidate areas for the selection of future acquisition projects, and has requested $6 million in matching federal funds for the purchase of three specific sites in FY07.

Significant expansion of public access to the coast has also resulted from regulation of waterfront development by the state Department of Environmental Protection (DEP), pursuant to Chapter 91 of the Massachusetts General Laws. This statute applies to all tidal waters (over both submerged lands and the "flats" lying between the tide marks) as well as on formerly filled areas. Pursuant to regulations promulgated in 1990, virtually every license DEP issues for shorefront property development -- from the simplest pier on a remote rural cove to the most elaborate mixed-use complex on the downtown waterfront of Boston Harbor -- includes conditions that establish a lateral accessway at the water's edge for public pedestrian use (and, frequently, connecting "radial" accessways as well).

Best available data regarding the extent of public access is provided in the table below. Apart from the specific gaps noted therein, the most significant limitation in characterizing this resource in quantitative terms is that virtually no cumulative data is available with respect to the substantial access benefits that have been obtained through the c.91 regulation program during the last 15 years. With regard to efforts to improve quantitative measures to assess progress in managing this issue area, an initiative is currently underway to more precisely keep track of the amount of coastal frontage in public and quasi-public ownership.

Access Type	Current Number(s)	Change Since Last Assessment
State/County/Local Parks (# and acres)	195 miles (*Massachusetts Coastal Land Inventory*, DEM, 1990)	Time series data not available
Beach/Shoreline Access Sites (#)	325 sites *(Massachusetts Coastal Land Inventory*, DEM, 1990)	11.8 miles of frontage added since 1995, per MassGIS (187 mi total)
Recreational Boat (power or non-power) Access Sites (#)	170 ramps (2005 survey of coastal boat ramps conducted by DFWELE)	40 new ramps, per MassGIS data
Designated Scenic Vistas or Overlook Points (#)	No statewide information available	No statewide information available
State or Locally Designated Perpendicular Rights-of-Way (i.e. street ends, easements) (#)	720 sites (*Compilation of Public Rights of Way Leading to the Shore*, DPW/Waterways, 1963)	Time series data not available
Fishing Points (i.e. piers, jetties) (#)	63 sites (MA *Saltwater Fishing Guide, 2000*)	Time series data not available
Coastal Trails/Boardwalks	No statewide information	No statewide information
ADA Compliant Access (%)	No statewide information	No statewide information
Dune Walkovers (#)	No statewide information	No statewide information
Public Beaches with Water Quality Monitoring and Public Notice (% of total beach miles) and Number Closed due to Water Quality Concerns (# of beach mile days)	508 marine bathing beaches; 288 total postings due to test exceedances (*Marine and Freshwater Beach Testing, MA DPH* 2004 *Annual Report*)	Incidence of marine beach postings has not changed since 2003
Number of Enhanced Public Access Sites (i.e. parking, restrooms, signage)	No statewide information available	No statewide information available

2. *Characterize the demand for public access, and the process for periodically assessing public demand.*

The most recent quantitative data indicating demand for coastal access in the Commonwealth is contained in a 2000 study commissioned for the State Comprehensive Outdoor Recreation Plan (SCORP). Survey results showed that "coastal beaches and shoreline" continued to be the most popular recreational resources in the state, visited at a median rate of 12 times per year by an estimated 61 percent of state residents, with even higher participation levels (70-83%) in evidence in the easterly regions of the state. Overall, visitation is projected to be 111 million person-trips per year, with the average one-way distance traveled being approximately 45 miles. At nearly twice the distance typically traveled to any other type of recreation area (except for more distant mountains), this datum is clearly indicative of the continuing strong desire among state residents to engage in shoreline recreation.

However, both the 2000 and 1995 SCORP surveys revealed that Massachusetts residents are not satisfied with existing opportunities for coastal recreation. Approximately one-third of respondents pointed to a

need for additional beach/shoreline facilities, consistent with the high need indicated generally for water-based facilities and for swimming areas in particular (the single most needed type of facility statewide).

3. *Identify any significant impediments to providing adequate access, including conflicts with other resource management objectives.*

The most significant obstacle to providing adequate access to the shoreline is the fact that since the early 1990s waterfront acquisition expenditures have declined dramatically in the face of government budget cuts and skyrocketing prices for waterfront land, coupled with a scarcity of undeveloped properties with significant park potential and willing sellers. From 1991 through 1995, all state environmental agencies together completed fewer than 10 shoreline acquisition projects involving an estimated total frontage of only four miles. In the last ten years (1995-2005), information provided in the MassGIS Protected and Recreational Open Space Datalayer reveals no significant increase in the pace of acquisition, with a combined total of approximately 12 miles of new frontage (and nearly 1000 acres in aggregate area) having been purchased by state, federal, and municipal governments, together with a variety of local and regional land conservation organizations.

Accordingly, roughly three-quarters of the Massachusetts coast -- more that 1100 miles in total – remains in private hands and is generally "off-limits" to the public-at-large. Along beach shoreline the degree of privatization is even higher, as four of every five miles (80%) is privately-owned -- all the way down to the low water mark. This refers to the unfortunate reality that Massachusets does not own the intertidal zone, i.e. the wet sand area between the mean high and low water marks. Pursuant to a colonial ordinance enacted in 1647, public access in this zone is allowed only for the purposes of fishing, fowling, and navigation, so the public does not have the right to simply stroll or engage in general recreation activity.

Compounding this problem is the fact that private property owners in increasing numbers have become quite expert in the art of access intimidation, especially when it comes to discouraging public use of old footpaths, town "landings", and other historic rights-of-way to the sea that in centuries past -- well before the era of the public beach and waterfront park -- were the primary means of connecting seaside communities to the sea. Many of these traditional accessways are still legally on the books but presently hidden and unknown, even to local residents, as a result of "accidental" concealment by abutting property owners whose gardens, lawns, and driveways have had an unfortunate tendency to encroach upon (and even obliterate) the corridors designated originally for public access.

4. *Describe the state's public access guide or website, and indicate how current the publication is and/or how frequently the website is updated.*

In Fall, 2004 CZM published the second, expanded edition of The *Massachusetts Coast Guide: Access to Public Open Spaces Along the Shoreline of Greater Boston Harbor and the North Shore.* The document includes 22 full-color maps showing the location of nearly 400 individual properties, together with brief descriptions of each site and appendix material listing both public transit and water transportation services. A portion of *Coast Guide* has been posted on the CZM website with additional material expected to go online later this year, and the separate Register project (described below) has utilized the Online Mapping Services of the MassGIS Program to further publicize access sites on the internet.

Management Characterization

1. *Identify significant changes since the 2001 Assessment in selected management categories, and characterize the effect of the changes in program outputs and outcomes.*

Three significant management changes have occurred since the last assessment, one negative and two positive. The negative involves the suspension of small-scale programs of technical/financial assistance to encourage local access initiatives, while the positive involves major strides in further developing the GIS database known as the "State Register of Protected Coastal Accessways" and in implementing a comprehensive program of monitoring beach water quality. Each change is summarized below.

Reduction in Technical/Financial Assistance

In 1995 CZM completed a special project to encourage communities to legally reclaim public property rights in old footpaths and other pedestrian accessways to the water's edge that still exist in law, but have been obscured in practice and are no longer usable by (or even known to) the public. As a follow-up in 1997, CZM joined forces with the Department of Conservation and Recreation (DCR) and the Attorney General's Office to establish an interagency program known as the Coastal Access Legal and Mediation Service (CALMS), which operated as clearinghouse for pro bono legal and/or mediation services to towns, nonprofit organizations, and other groups or individuals, through referral to a volunteer network of dispute resolution professionals. As of 2001 CALMS had worked on 15 cases, of which two had been resolved and the remaining 13 were still in various phases of mediation or litigation. Since then CALMS has not accepted new applications for assistance, due to a shortage of private attorneys willing to participate on a no-fee basis combined with agency staff attrition necessitated by state budget cuts.

A second interagency initiative that is also dormant now consisted of the Coastal Access Small Grants Program, administered from 1995-2000 by DCR and by CZM for an additional year thereafter. In it's seven-year history this well-received program disbursed approximately $410,000 to some fifty-four coastal communities to fund 131 separate access-related projects. Like CALMS, unfortunately, this program also has been suspended since 2002 due to reductions in personnel and capital budgets.

Expansion of Access-Related Databases

Another major access undertaking at CZM during the 90s was to establish an electronic "State Register of Protected Coastal Accessways", to keeps track of all shoreline access entitlements that have been secured for the public not only through outright public and quasi-public ownership of land, but also in the form of easements, rights-of-way, c. 91 license conditions, or other encumbrances on private shorefront property. The process of building the Register database began in 1995 with the completion of an inventory of all publicly accessible coastal properties owned by federal, state, and local governments and by non-profit conservation organizations from Newburyport to Hull. During 2005, fieldwork to collect information on such public access sites along the remainder of the coast has accelerated with the hiring (using section 309 funds) of a full-time contract employee. With the assistance of MassGIS staff, the Register is being reconstituted as a subset of the Protected and Recreational Open Space datalayer, and is being posted on the internet through the On-Line Mapping Service of MassGIS.

Expansion of Water Quality Monitoring at Marine Beaches

In 2000 the legislature passed the Massachusetts Beaches Act requiring all public and semi-public beaches to be tested weekly during beach season, with lead responsibility assigned to the Massachusetts Department of Public Health (DPH). As part of this program, DPH maintains an inventory of marine bathing beaches (including a detailed GIS datalayer); compiles and analyzes monitoring data and communicates such data to the public in a timely fashion; and conducts assessments of those beaches identified as high risk. Further details are available in the latest annual report on beach testing, online at www.mass.gov/dph, as well as in a paper presented by DPH staff at the October 2004 National Beaches Conference entitled "The Massachusetts Experience: Development of a Beaches Data Management Infrastructure and Reporting System".

Conclusion

1. Identify priority needs or major gaps in addressing the programmatic objectives for this enhancement area that could be addressed through a 309 Strategy.

CZM has identified three priority needs in addressing our programmatic objectives for the access enhancement area. The first two represent a carry-over from the 2001 Assessment, while the third is new for this Assessment.

Keeping Track of Chapter 91 Access Entitlements

The first large gap in addressing the CZM public access objectives involves the inaccessibility of information about public access entitlements secured through Chapter 91 license conditions. Since 1866, the Massachusetts Wetlands and Waterways Program has issued well over 20,000 licenses and permits, many of which include conditions related to coastal access under Chapter 91. All this information is currently available exclusively on paper. At present, licenses are numbered progressively and their location marked on various small-scale maps. The licenses and associated terms and conditions, usually composed of text and graphic (a plan), are manually retrieved whenever needed by personnel at DEP offices in Boston. In short, critical information about opportunities for public access is buried under a mountain of agency paperwork.

Acquiring Intertidal Strolling Rights

With respect to combating the growth in exclusionary practices along the privately-owned segments of the shoreline, a major gap still exists in the state's capability to acquire new easements for public access along and to the shoreline. In 1991 the Massachusetts legislature enacted a law authorizing the Department of Conservation and Recreation (DCR) to acquire for the public, using the power of eminent domain, the right to walk from dawn to dusk within the intertidal portion of privately-owned shorefront properties. Realizing the full potential of this "Seapath" legislation depends to a large extent on the cost of obtaining the necessary easements, and several years ago DCR recognized the limitations of conventional appraisal techniques and sponsored preliminary research to develop a special methodology for the valuation of intertidal strolling rights. Although instructive as a "first cut" at the problem, the results were inconclusive and the acquisition program has been suspended indefinitely as a result.

Improving Public Outreach

The last decade has seen an explosion of activity in developing and mapping trails of every description, in all regions of the coast. A telling indicator is that nearly 40% of the 131 Coastal Access Small Grants awarded during 1995-2001 were for some type of trail-related project, and there is a wealth of anecdotal evidence as well. The result of all this trail-making effort has been a tremendous increase in "coastwalking" opportunities for the public, at least in principle. In practice, actual trail utilization is severely limited by the fact that maps, directions, and basic information about the trail experiences offered are frequently non-existent or difficult to obtain, being scattered among a plethora of individual pamphlets that are almost always in short supply if not out-of-print altogether. Nor has the Internet been used extensively to disseminate trail information, except in a few larger towns and regional organizations (and even then the information is not always complete enough for direct trail use, or sufficiently readable when downloaded).

2. What priority was this area previously and what priority is it now for developing a 309 strategy and allocating 309 funding, and why?

Last Assessment: **High** This Assessment**: Medium**

Nine out of ten Massachusetts' residents live within an hour's drive of the coast, and visiting the shore is one of the most popular recreational activities in the Commonwealth. Yet, with strong legal and political traditions excluding the public from extensive stretches of private shoreline, and with shoreline acquisition programs in dramatic decline, the goal of having a coast that is truly "open to all" remains unfulfilled in the Commonwealth. Accordingly, public access enhancement remains a high priority.

Public Access: Strategy

Program Change Overview

The access enhancement strategy for 2005 consists of three proposed projects, two of which relate to what has become CZM's core mission in this area: to keep track of and publicize all the "access entitlements" that government agencies and nonprofit conservation organizations have established for the public using any kind of legal instrument (title to property, permit conditions, easements and deed restrictions, consent orders and other enforcement-related agreement, legislative enactments, and so forth). The third project represents a continuation of CZM's longstanding efforts to provide technical assistance to other state environmental agencies and municipalities who use the powers of government to directly expand coastal access facilities, either by spending money to acquire public property rights or by regulating private development of shorefront land areas.

Taken together, these projects are designed to continue laying the groundwork for the creation of a "coastal trails" program as a complementary addition to the state's existing coastal land acquisition efforts. As described previously in the 2001 Strategy, CZM believes that substantial expansion of coastal access can be achieved in a way that does not require extensive government ownership of waterfront land or heavy spending on recreational facilities. The alternative is to strategically acquire easements and other new rights-of-way across private shorefront properties in order to knit together a series of otherwise isolated existing pathways into a well-connected pedestrian network, with points of origination located at public recreation sites or at locations where parking or public transportation is available. In organizational terms, the State Department of Conservation and Recreation (DCR) has the necessary legislative authority and administrative experience to establish a new management program based on the coastal trails concept, but severe budget limitations continue to inhibit this program change. Nevertheless, steady progress has been and can still be made in laying a solid foundation for subsequent pursuit of trail planning and related technical assistance initiatives.

Project 1: Coastwalking on the Web

Summary of Enhancement Tasks

As noted in the assessment section, a gap exists in the state's ability to disseminate trail maps and associated literature (in both electronic and paper form) that provide "on-the-ground" identification of pedestrian trails offering public access to and/or along the Massachusetts shoreline. CZM will address this problem by using our existing web site as a central source of downloadable, user-friendly material that is otherwise not widely available. The project will involve two basic activities: (1) compilation of existing recreational trail maps and literature through contact with all relevant sponsoring organizations at the local, state, regional, and federal levels, and through general research including web searches, visits to major bookstores, communication with walking/hiking clubs, and so forth; and (2) conversion of the appropriate paper documents to electronic form and posting (with permission as necessary) on a separate section of the CZM web site dedicated exclusively to "coastwalking" opportunities (with links to other

web sites serving the same purpose). Our goal is to become a clearinghouse for one-stop shopping for information on coastal trails anywhere in the state.

We will be highly inclusive in compiling existing graphic and text material for virtually all sizes and types of trails. The inventory will encompass short footpaths and more extended nature trails on individual properties; tourist walking tours common in historic waterfront districts; various forms of "point" access such as town ways and landings; multi-property pathways like the Atlantic Path in Rockport and the Boston Harborwalk; and appropriate portions of multi-community networks like the Cape Cod Pathways and Merrimack Valley Off-Road Trails. For inventory purposes, the basic criterion for including a documented trail will be that at least one segment thereof either abuts the shoreline or comes within reasonably close viewing distance of the ocean. As much of the acquired materials as possible will be posted on the CZM website, the navigation structure of which allows for the internal addition of fully functioning, stand-alone websites that focus on a single program or issue.

Project Appropriateness and Likelihood of Success

The project is very much in keeping with the statewide and regional perspective reflected in DCR's Commonwealth Connections: A Greenway Vision for Massachusetts, which calls for "a coordinated network of connected open lands, rivers, and trails crisscrossing the state, protecting important landscapes, bridging communities, and linking important destinations." The more that vision becomes a reality, the greater will be the need for concerted outreach efforts to maximize public use and enjoyment of the network, which (for coastal segments) is the underlying goal of the project we propose.

CZM believes the need for the project is great. With all the effort being expended to expand opportunities for public recreation through the use of coastal trails, the time has come to make sure the public is fully aware of such opportunities, and there's no more effective way to achieve a quantum leap in public awareness than by utilizing the power of the Internet. Support for the project takes the form of the endorsement and pledge of cooperation from various state and regional organizations that have played a leadership role in promoting trail development in coastal areas. These include the Cape Cod Commission/Pathways Program, the Essex National Heritage Commission, the Essex County Greenbelt Association, the Merrimack Valley Regional Planning Commission, and the Riverways Program of the Massachusetts Department of Fish and Game.

Work Plan and Estimated Costs

The project is envisioned as a one-year effort requiring the full-time services of a GIS Specialist. The estimated total cost of the project (salary for one FTE consultant for 48 weeks plus indirect costs at 24% of salary, plus incidental expenses related to data acquisition and web-site development) is $80,000.

Project 2: Complete Statewide Inventory of Coastal Accessways

Summary of Enhancement Tasks

This project will address the largest remaining gap in the CZM Register of Protected Coastal Accessways, which is the lack of information regarding public access entitlements obtained as a condition of c.91 licenses for uses/structures on waterfront properties containing filled or flowed tidelands. Further contract work will be carried out to secure appropriate data from the DEP/Waterways Program regarding the location and features of all pedestrian walkways that have been established in this manner. A second goal will be to improve the license tracking software in use by waterways staff, which does not include appropriate fields for access conditions, and to improve the means presently used for parcel identification (hampered until recently by the fact that assessor lot numbers were not required on license applications). A few years ago DEP contracted with UMASS Boston to design a pilot digital database of Chapter 91 licenses and permits

in New Bedford and Pleasant Bay on Cape Cod. The project involved the conversion of current paper information to digital format, the creation of a database, and the design of a website for the public to retrieve information. This pilot project represents a useful foundation for a more comprehensive effort to incorporate Chapter 91 accessways into the Register.

A second focus of this project will be to expand the Register to include information from a number of communities that have completed inventories of historic rights-of-way that exist on private shorefront properties. A survey will be completed to collect the available information for Register purposes, and a related task will be to encourage additional coastal communities to identify local access points not presently documented and take steps to ascertain their correct boundaries. This is best accomplished by (a) revising The Open Space Planner's Workbook by the Division of Conservation Services (DCS), which contains guidelines for preparing open space plans as a prerequisite to applying for various state grants for open space and recreation facilities, to require compilation of appropriate data on coastal accessways; (b) earmarking funds to assist coastal communities with this effort, to be disbursed through an interagency service agreements as appropriate; and (c) incorporating a requirement for an access inventory into the work plan for communities seeking state approval (through CZM) of municipal harbor plans.

Project Appropriateness and Likelihood of Success

The GIS database known as the "CZM Register of Protected Coastal Accessways" is a potentially powerful tool for access advocacy at all levels. With its capability to integrate site-specific information and display access locations in map form, the Register has several useful applications in the areas of access planning, outreach, and enforcement. However, the Register concept is still not completely functional as a technical assistance resource, and this project addresses the single most important need for improvement in this key component of CZM's public access program. Adding information concerning the numerous public access entitlements that have been secured on private waterfront properties will significantly expand public awareness of the availability of these sites for passive recreation purposes. It will also facilitate coastal trail planning by helping identify opportunities for linking to nearby parklands and pathways that are already in the public domain, and will guide new acquisition of rights-of-way and recreation lands.

The likelihood of attaining the program enhancement objectives associated with the project is high. We have consulted extensively with the two CZM-network agencies to be involved in carrying out the proposed tasks (DEP, MassGIS), and both are strongly supportive of the proposed program changes and implementation activities. It is also important to note that the project builds directly upon the groundwork laid in previous 309 enhancement efforts to build the Register database at CZM. Thus, the strategy rests upon a solid foundation of recent accomplishment, which has generated considerable institutional momentum in the direction of meaningful program change.

Work Plan and Estimated Costs

The project is envisioned as a one-year effort requiring the full-time services of a GIS Specialist. The estimated total cost of the project (salary for one FTE consultant for 48 weeks plus indirect costs at 24% of salary, plus expenses related to acquisition of appropriate data management software) is $125,000.

Project 3: Seapath Evaluation Methodology

Summary of Enhancement Tasks

Effective implementation of the 1991 strolling rights legislation was one of the cornerstones of the 1997 Public Access Enhancement Strategy, and for this reason CZM wishes to take the lead in reactivating this important R&D effort. CZM has previously contracted with a resource economist to help review prior work products and other relevant documents, including appraisal data from recent Seapath and other trail-

related projects. This review succeeded in identifying an innovative strategy for valuation together with the additional field data that needs to be collected to support the development of a more appropriate appraisal methodology. Having successfully completed the pilot phase of this project, CZM will contract for the services of a resource economist and a real estate appraisal firm to work in partnership on the development of a new technique for determining the value of beach strolling rights. During the pilot phase it became clear that conventional valuation tools as applied separately by such professionals provide unsatisfactory results, and that the analytical challenge is better met when the respective tools are combined into a novel, hybrid methodology.

In simplest outline form, the valuation process would begin with the use of standard appraisal techniques to separate the total value of a waterfront property into the traditional land and building components, and then to further break out from the land value the "frontage premium" that buyers have been willing to pay direct contact with the ocean. Then, a mathematical model based on regression analysis would be applied to determine how much of the frontage premium is attributable to various *amenity factors,* which are primarily physical characteristics like quality of views, size and type of beach, suitability for boat docking, susceptibility to flooding, and so forth. The residual value, i.e. that which cannot be associated with such discernible physical attributes, would be presumed to derive from less tangible *exclusivity factors,* among them being whether or not the public enjoys a right of lateral passage. At this point the professional judgment of the appraiser would be reengaged to estimate what weight this factor should have in the context of other relevant considerations, such as the extent to which a property is likely to experience public pedestrian traffic due to proximity to a public beach or other access point, the use intensity of such nearby facilities, and the difficulty of preventing trespass.

The proposed project centers on the regression modeling of the factors underlying the "frontage premium", which in turn will require the collection and analysis of extensive data on real estate transactions involving shorefront and near-shorefront properties in Massachusetts. A wealth of such data was accumulated during the original DEM study carried out a decade ago, and this data set will provide a useful starting point. However, since the elapsed time has been substantial, it is likely that extensive additional fieldwork will be required to assemble a statistically significant sample. Moreover, the task of breaking out the land value components and then estimating the corresponding frontage premiums will be quite labor-intensive on the part of the appraisal team. As a result, the effort will be considerably more costly than the typical one-year 309 enhancement project, so it will be undertaken over at least a two-year time frame and matching funds will be solicited from non-CZM sources, with one possibility being the Massachusetts Environmental Trust. The end product will be a comprehensive report that identifies the shortcomings of conventional valuation techniques and describes the alternative methodology, complete with guidance for application to actual field situations.

Project Appropriateness and Likelihood of Success

With acquisition of waterfront properties for public recreation at a relative standstill due to skyrocketing land costs, state and local governments increasingly find it desirable to acquire lateral access easements on private waterfront properties as a more cost-effective means of expanding public access to the coast. State law authorizes and encourages acquisition of such "seapaths" by the Department of Conservation and Recreation (DCR), and several communities have expressed strong interest in this approach (examples from the Cape Cod and Islands region are Orleans, Brewster, Truro, and Nantucket). As discussed in the assessment section, however, the lack of a credible methodology for establishing the fair market value for public strolling rights has severely discouraged seapath acquisition initiatives.

The likelihood for success is difficult to predict. However, in the event a defensible methodology emerges from this project, the significance could be enormous for Massachusetts as well as other coastal states.

Work Plan and Estimated Costs
The project is envisioned as a two-year effort with an approximate yearly budget of $75,000 for consulting services.

Section 309 Programmatic Objectives

I. Direct future public and private development and redevelopment away from hazardous areas, including the high hazard areas delineated as FEMA V-zones and areas vulnerable to inundation from sea and Great Lakes level rise.

II. Preserve and restore the protective functions of natural shoreline features such as beaches, dunes, and wetlands.

III. Prevent or minimize threats to existing populations and property from both episodic and chronic coastal hazards.

Coastal Hazards Characterization

1. Characterize the general level of risk in your state from the following coastal hazards:

Hazard	High Risk	Medium Risk	Low Risk
Hurricanes	✓		
Storm surge	✓		
Flooding	✓		
Shoreline Erosion	✓		
Sea Level Rise	✓		
Subsidence		✓	
Geologic Hazards: earthquakes & tsunamis		✓	
Northeasters	✓		

2. If the level of risk or state of knowledge about any of these hazards has changed since the last assessment, please explain. Also, identify any ongoing or planned efforts to develop quantitative measures for this issue area.

- *New/updated shoreline change data*
- *Revised flood Zone maps*
- *Updated state hazard mitigation plan*

CZM updated our historic shoreline change maps with a 1994 shoreline and made the data available on-line in a user-friendly browser in 2001. The products provide decision makers, property owners, and other interested parties with more recent information and more robust statistical basis regarding shoreline trends in Massachusetts. Analysis of the new data by the U.S. Geological Survey, Woods Hole Oceanographic Institution Sea Grant Program, and Cape Cod Cooperative Extension reveals that approximately 68 percent, or 513 miles, of Massachusetts' ocean-facing shore exhibits a long-term erosional trend, 30 percent, or 226 miles, shows long-term accretion, and two percent, or 15 miles, shows no net change. This project was funded with Section 309 funds.

CZM is working with the Federal Emergency Management Agency (FEMA) to re-delineate Velocity zone (V-zone) boundaries in sand dunes for four coastal communities in Massachusetts. Many V-zones on the current flood insurance maps are outdated and in need of revision due to beach erosion and changes in mapping methodology, including a change to FEMA's National Flood Insurance

Program (NFIP) regulatory V-zone definition in 1988. V-zones are now defined to extend, at a minimum, to the landward toe of the primary frontal dune (PFD). Many areas of the primary frontal dunes are currently mapped as 'C' or 'X' zones, which are outside the 100-year floodplain. Since the re-delineation of the V-zone may impact insurance rates and development, a methodology that is defensible, and repeatable is of paramount importance. The methodology developed by CZM utilizes both knowledge of local geologic processes and remote sensing/GIS technologies to ensure that V-zones are mapped consistently, and is currently being evaluated by FEMA to facilitate V-zone delineation in the FIRM update process. This project was funded through Section 309 and a grant from FEMA.

One of CZM's projects designed to identify and assess damage mitigation strategies for existing and future development in the coastal zone is our Repetitive Loss (RL) project. The RL project explored the correlations between frequently damaged properties and a range of coastal process parameters, such as shoreline orientation, geomorphology, and shoreline change rates. Based on our initial analysis, the highest concentrations of repetitive loss properties occur in relatively low-lying areas in or adjacent to coastal beaches and dunes, and along northeast facing shorelines exhibiting highly altered landforms, and concentrated development. Further, the data appear to indicate that the extent and severity of flood hazards have been underestimated, resulting in the application of less stringent building and design standards. This study was funded with Section 309 funds.

In 2004, the Massachusetts Emergency Management Agency and the Massachusetts Department of Conservation and Recreation, in cooperation with the Massachusetts Interagency Hazard Mitigation Team, completed a significant effort to revise and update the Massachusetts Hazard Mitigation Plan. The revised plan identifies and profiles the range of natural hazards affecting the Commonwealth, assesses the state's risk and vulnerability to natural hazards, examines existing hazard mitigation capabilities, develops statewide mitigation goals and strategies, and establishes a framework for implementing those goals and strategies as well as for monitoring, evaluating and updating the plan. This effort was funded by a combination of state and federal funds. CZM serves on the State Hazard Mitigation Team, and provided technical review and input to the plan.

3. *Summarize the risks from inappropriate development in the state, e.g., life and property at risk, publicly funded infrastructure at risk, resources at risk.*

People, private property, public infrastructure, and natural resources continue to be at risk as a result of development in hazard-prone areas in the Massachusetts coastal zone. There is a significant amount of development and infrastructure located proximate to the shoreline in erosion and storm damage prone areas. Natural resources are also at risk from development and redevelopment where the beneficial functions of the resources are not protected by the current regulations, and where the natural resources are being destroyed as a result of previous human alterations (eg seawalls and groins). The storm damage hazards are also significantly underestimated on the current flood insurance rate maps; primarily due to lack of funding since the mapping methodologies were updated in the late 1980's. Nearly three quarters (74%) of the flood insurance rate maps in Massachusetts are over 15 years old; 60% are over 20 years old. Even where the flood maps have been revised, property owners are often unaware of that they are in a storm damage prone area.

Management Characterization

1. *Indicate significant changes to the State' hazards protection programs since the last assessment:*

Mechanism	Changes since Last Assessment
Building Setbacks/Restrictions	Moderate
Methodologies for determining setbacks	None
Repair/rebuilding restrictions	Moderate
Restriction of hard shoreline protection structures	Moderate
Promotion of alternative shoreline stabilization methodologies	Moderate
Renovation of shoreline protection structures	Moderate
Beach/dune protection	Moderate
Permit compliance	Moderate
Inlet Management Plans	Moderate
Special Area Management Plans	Moderate
Local hazards mitigation planning	Significant
Local post-disaster redevelopment plans	None
Real estate sales disclosure requirements	None
Restrictions on publicly funded infrastructure	Moderate
Public Education and Outreach	Moderate
Mapping/GIS/tracking of hazard areas	Significant

2. *For categories with changes:*

   - *Summarize the change*
   - *Specify whether it was a 309 or other CZM driven change and specify funding source*
   - *Characterize the effect of the changes in terms of both program outputs and outcomes*

Building Setbacks/Restrictions & Repair/rebuilding restrictions

Partially as a result of technical assistance and research products developed by CZM, individual communities have implemented local bylaws/ordinances that restrict development in hazardous areas, such as the floodplain. In one recent case, the Town of Chatham's decision to deny new construction in the 100-year floodplain was appealed all the way to the Massachusetts Supreme Judicial Court, where the Town's decision was upheld. This is an excellent precedent for Towns considering similar regulations. CZM staff time is partially funded through section 309 and section 306 of our NOAA grant.

Restrict hard shoreline protection structures, Promotion of alternative shoreline stabilization methodologies & Renovation of shoreline protection structures

Partially as a result of technical assistance from CZM, individual communities have implemented local bylawas/ordinances that restrict the use of hard shoreline protection structures. CZM established a contract with a coastal engineering firm for on-call engineering services to enhance our ability to provide technical assistance to local, state, and federal officials regarding ways to reduce or minimize impacts when a project involves the construction or reconstruction of coastal engineering structures. This contract has enabled CZM to provide more specific recommendations for minimizing the impacts associated with existing structures, new structures, and evaluation of alternative shoreline stabilization technologies. Funding for the engineering contract has been primarily through Section 309.

Beach/dune protection, Special Area Management Plans, Inlet Management Plans, and Public Education and Outreach

Local communities have increased protection of beaches and dunes through local wetlands protection bylaws and regulations that are stricter than state regulations. In addition to local funding, many communities rely on CZM to provide technical assistance in developing these bylaws and special area management plans that focus on protection of floodplains, barrier beaches, coastal dunes, and inlet management.

Permit compliance program

The Massachusetts Department of Environmental Protection has significantly increased their emphasis on enforcement over the past few years. This effort was funded by state funds.

Local hazards mitigation planning

As a result of new federal legislation, communities are required to prepare multi-hazard mitigation plans as a pre-requisite for receiving disaster assistance and hazard mitigation grant money. DCR is working cooperatively with the regional planning agencies to ensure that communities receive technical assistance in the development of these plans. CZM provides technical assistance as needed to support this effort.

Restrictions on publicly funded infrastructure

CZM has developed draft guidance for local communities regarding compliance with state and federal executive orders required as part of their application for state or federal funds for infrastructure projects in areas subject to storm damage, flooding and erosion. The purpose of the document is to address the public health, environmental, and economic concerns associated with these projects to ensure that potential public investment is appropriate. CZM will be working with the Massachusetts DEP and the U.S. Environmental Protection Agency to finalize and distribute this guidance to communities considering infrastructure projects in hazardous coastal areas.

Mapping/GIS/tracking of hazard areas

As described above, CZM has established a Cooperating Technical Partners relationship with FEMA to map primary frontal dunes; the result will be updated flood maps with V-zone boundaries located further landward to more accurately depict the flood hazards. This was partially funded by Section 309.

CZM completed a pilot Coastal Structures Inventory Project in 2004 that created a georeferenced, pre-storm inventory to improve the state and local governments' ability to make rapid and accurate storm-related permitting decisions. This project resulted in a centralized database of photographs and information about coastal structures such as docks, piers, jetties, seawalls, stairways and buildings. The inventory will be made available through a browser on the MassGIS website. The project was funded by a grant from NOAA.

3. *Discuss significant impediments to meeting the 309 programmatic objectives (e.g., lack of data, lack of technology, lack of funding, legally indefensible, inadequate policies, etc.)*

Some impediments to our efforts to meet the 309 objectives include the following:

- The extent and severity of damage prone areas are significantly underestimated on the current flood insurance rate maps.

- CZM geology staff turnover;
- Lack of funding to tackle more expensive projects
- Lack of datasets for research projects, resulting in more time and money being spent to obtain and process data instead of analysis
- Cuts in state funding for environmental agencies.
- Difficulties in providing sufficient education and outreach products as part of each research project; we need to get our message out more effectively.
- The high turnover rate of local officials
- Most regulation of activities in coastal landforms being done by volunteers at the local level in Massachusetts.

Conclusion

1. *Identify priority needs or major gaps in addressing the programmatic objectives for this enhancement area that could be addressed through a 309 Strategy.*

   CZM has identified several specific needs that would improve our ability to address the programmatic objectives, including:

   - Current flood insurance rate maps do not reflect the actual hazards associated with coastal storms. If the level of hazard have not been accurately mapped it is more difficult to direct development away from hazardous areas or protect the beneficial functions of the resource areas to provide storm damage protection and flood control.
   - An atlas of coastal hazards variables (e.g. shoreline change, littoral cells, susceptibility to sea level rise, etc.) that establishes the to assist decision makers in evaluation of the potential impacts associated proposed projects.
   - Written guidance for decision makers regarding the application of coastal processes when permitting projects that will likely affect the storm damage prevention and flood control functions of coastal resources. This will improve the effectiveness of CZM technical assistance by providing local officials with the information necessary to frame and approach local project reviews.
   - Performance standards for the 100-year floodplain are needed to preserve the beneficial functions of this resource; Massachusetts regulations identify the floodplain as a resource area, but do not contain performance standards.

2. *What priority was this area previously and what priority is it now for developing a 309 strategy and designating 309 funding and why?*

   Last Assessment: **High** This Assessment: **High**

Many areas of the Massachusetts coastline are experiencing storm damage more frequently during relatively small coastal storm events (eg 5-10 year return frequency storms). There is also more pressure for development along the shoreline, which is likely to further diminish the natural landform's ability to provide the beneficial functions of storm damage protection and flood control. The combination of these factors results in increased vulnerability to loss of life, private property damage, public property and infrastructure damage, and increased requests for public assistance with erosion and storm damage mitigation. CZM is pursuing a pro-active approach to coastal hazards by developing more detailed coastal hazards management tools that will facilitate the review of proposed projects that may be vulnerable to coastal hazards, promote the storm damage protection and flood control functions of coastal landforms, and notify the public of impending danger from coastal storms such as hurricanes and northeasters.

Program Change Overview

The Section 309 Coastal Hazards Assessment identifies specific gaps that affect our present ability to preserve and restore the protective functions of natural shoreline features such as beaches, dunes and wetlands or to discourage or prevent development in hazard prone areas. The major gaps include the need for updating the flood insurance rate maps to accurately reflect the hazards associated with coastal storms; clear guidance for implementing regulatory requirements protecting sensitive coastal resources and their ability to provide storm damage and flood control protection to landward areas; an atlas of coastal hazards variables that includes updated shoreline change maps, littoral cell maps, and a measure of susceptibility to sea level rise; and regulatory performance standards for the Land Subject to Coastal Storm Flowage resource area (the 100 year floodplain) under the state Wetlands Protection Act regulations.

The projects described below will address these needs for program change, by producing a set technical guidance documents to regulatory decision-makers, which in turn will result in meaningful improvement in coastal hazard management. DEP has agreed to participate in the development of these products to ensure that they are consistent with DEP regulations and policies**.**

Project 1. Provide Technical Support to FEMA for Primary Frontal Dune Mapping

Summary of Enhancement Tasks
Many velocity zones on the current flood maps for Massachusetts are outdated and in need of revision due to beach erosion and changes in mapping methodology, including changes to FEMA's National Flood Insurance Program (NFIP) regulatory Velocity zone definition in 1988. V-zones are now defined to extend, at a minimum, to the landward toe of the primary frontal dune (PFD). CZM has developed a methodology for the delineation of PFDs that utilizes both knowledge of local geologic processes and remote sensing/GIS technologies. CZM has mapped the PFD for four coastal communities as part of a pilot project funded by FEMA and our section 309 grant. Since many PFDs are currently mapped as being outside the 100 year floodplain, the revision of the flood maps will significantly improve the state of knowledge regarding the actual extent of flood zones, making it easier to direct public and private development and redevelopment away from these zones. FEMA has requested that CZM continue mapping primary frontal dunes for the remaining coastal communities in Massachusetts as each study is updated and flood insurance maps are revised by FEMA's map modernization program.

CZM will work with FEMA through their Cooperating Technical Partners (CTP) Program to delineate the PFD in each community at the same time the flood insurance study is underway through one of FEMA's study contractors. CZM will also assist FEMA in the development of training materials to ensure that study contractors can conduct PFD delineations in the future.

Project Appropriateness and Likelihood of Success
This project will build on the success of the three-year pilot project FEMA and CZM worked on through the CTP Program. By establishing a methodology that is scientifically based, repeatable and defensible, CZM and FEMA believe that the degree of public controversy associated with the revised V-zone boundaries will be significantly reduced. Therefore, there should be fewer appeals of the proposed flood insurance maps, resulting in quicker adoption and implementation of the revised maps. The result will be updated insurance maps depicting coastal hazards based on contemporary principles of flood mapping.

FEMA and CZM have received national recognition for our work to date on the proposed PFD methodology. The detailed methodology has been presented to FEMA regional staff, headquarters staff, a panel of coastal geologists, technical consultants for FEMA, the Association of State Floodplain Managers 2004 Annual Meeting, the New England Floodplain Managers 2004 Annual Meeting, and the 2005 New England Mitigation Conference. The feedback we have received has been positive, particularly regarding the extent to which the methodology reduces subjectivity in delineating the landward toe of the PFD.

Work Plan and Estimated Costs

The schedule will be dictated primarily by FEMA's Map Modernization Program to update all flood insurance rate maps in the country. Due to the size of the program and the finite amount of funding available, the schedule is still being refined. However, based on the current information we have, CZM expects to be providing assistance to FEMA in all five years covered by this Strategy.

The FEMA Map Modernization Program will fund the majority of this work, relying on CZM staff to provide geology and GIS expertise. The estimated cost associated with CZM staff time is $15,000 for two consecutive years.

Project 2. Coastal Hazards Toolbox

Summary of Enhancement Tasks

The intent of the Massachusetts Wetlands Protection Act regulations is to protect the beneficial functions of the natural shoreline features such as beaches, dunes, barrier beaches, and coastal banks. The performance standards define specific characteristics of resources to be considered during project review. Very little written guidance regarding alternatives or best management practices is available.

Through site visits, verbal and written guidance, and formal agency comments on projects, CZM coastal geologists and regional staff provide site-specific technical assistance to local, state and federal officials. A review of past CZM comment letters indicates that most technical assistance promotes a fundamental approach based on identifying baseline information requirements necessary to effectively evaluate projects that may be subject to coastal hazards.

Recognizing the information value and commonality in approach, CZM proposes a state-wide effort to make its technical assistance program more efficient by providing local officials with the information necessary to frame and approach local project reviews and decision making. When completed, local officials will have access to a primary reference regarding the application of coastal processes when permitting projects that are likely to affect the storm damage prevention and flood control functions of coastal resources, practical advice on how to obtain and assess the information needed to evaluate these projects, and an Atlas of Coastal Hazards that can be used to place individual projects in the context of potential coastal hazards and to identify information necessary for their review. In fiscal year 2005, CZM completed the scoping for the coastal geology workbook and has contracted with a consultant to complete the Atlas of Coastal Hazards for the South Shore region.

Project Appropriateness and Likelihood of Success

This project will expand the current understanding of local regulatory officials regarding options for minimizing and avoiding adverse impacts to sensitive coastal resources. This project will document the types of information that should be submitted to Conservation Commissions to facilitate review of the potential impacts of a proposed project, provide guidance regarding the review of resource delineations,

describe the functions and performance standards for each resource area and how they interact, and identify alternatives and methods of minimizing impacts. CZM believes that providing these resources to all coastal decision-makers will significantly improve their ability to preserve and protect our coastal resources as well as minimizing the threat to existing development from coastal hazards.

There is a substantial demand from Conservation Commissions for site-specific technical assistance regarding coastal processes. Given the limited staff resources at CZM, we are not able to provide as much assistance as local officials would like. Many local officials have requested that additional written resources be provided so that they can be more effective without having to call for assistance as often. CZM geologists, outreach staff, regional coordinators, and other technical staff have worked closely to scope the guidance documents that will be produced to meet the needs of our target audience. Therefore we believe that this guidance will be well received and provide an essential reference for local decision makers. Finally, applicants and proponents are generally receptive to guidance that clarifies the types of information that are needed to facilitate the Conservation Commission's review.

Work Plan and Estimated Costs

Part 1: Guidance document for local officials

Based on the detailed project scope already completed, in years 1 and 2, CZM will develop a guidance document to help Conservation Commissions evaluate proposed projects in coastal resources, and develop a distribution strategy for the document. CZM will work with the DEP to ensure that the content of the guidance is consistent with their policies and practices for administering the Wetlands regulations. The funds requested for this project are primarily for the printed version of the publication. In year 3, CZM will conduct workshops in each region of the coast to introduce the guidance to local officials.

In year 4 and 5, CZM will use existing information to develop fact sheets and brochures for distribution to better inform the public and local officials regarding the potential threats to life and property associated with coastal hazards. For example, CZM, DEP and DEM worked together to produce a brochure: "Protecting Coastal Property From Major Storm Damage: What to Do and Who to Contact Before Building or Rebuilding Near the Coast." This brochure was a very effective educational tool for local officials and residents. CZM proposes to update this brochure and reprint it.

Part 2: Coastal Hazards Characterization Atlas

CZM proposes to create a coastal hazards atlas for each region of the Massachusetts coast that includes maps and accompanying classification systems for multiple shoreline variables, including: littoral cells, updated shoreline change, dominant coastal processes affecting sediment dynamics within each littoral cell, shoreline type, engineered shorelines, shoreline variability to sea level rise, and shoreline susceptibility to repetitive loss. CZM proposes to prioritize the regions for mapping based on the relative number of repetitive damage properties in each region and their recent storm damage history. In fiscal year 2005, CZM will complete the first atlas in this series for the South Shore region. The following regions have been prioritized as follows: Year 1: North Shore; Year 2: Buzzards Bay; Year 3: Cape Cod; Year 4: Nantucket and Martha's Vineyard; Year 5: Boston Harbor region

Estimated costs for **Part 1** are $10,000 in Year 1 and $5000 per year for the following four consecutive years, for an estimated total of $30, 000. Estimated costs for **Part 2** are: Year 1 - $75,000; Year 2 - $75,000; Year 3 - $100,000; Year 4 - $75,000; Year 5 - $75,000, and the estimated total is $400,000.

Programmatic Objectives

I. Protect and preserve existing levels of wetlands, as measured by acreage and functions.
II. Increase acres and associated functions of restored wetlands.
III. Utilize non-regulatory and innovative techniques to provide for the protection and acquisition of coastal wetlands.
IV. Develop and improve wetlands creation programs as the lowest priority.

Resource Characterization

1. Extent of coastal wetlands

The current extent of coastal resources broken down by type as per the NOAA guidance is listed in Table 1 and further described in the narrative below.

Table 1. Extent of coastal wetlands.

Wetlands Type	**Extent in acres (various years[1])**	**Trends**
Tidal: Salt Marsh (all)	45,480	-26 acres/year [2]
Tidal: Flats (all)	19,130	n/a
Sub-Tidal: Submerged Rooted Vegetation (all)	39,140	declining [3]
Non-Tidal/Freshwater (in Coastal Zone)	30,299	n/a
Publicly Acquired Wetlands (in Coastal Zone)[4]	54,032	n/a
Restored Wetlands: Salt Marsh[5]	520	+52 acres/year
Created Wetlands	n/a	n/a

1. Data is from the MA DEP Wetland Conservancy Program except restored wetlands (see note 4). Data developed from various years of photography, from 1990 to 2000, on base 1:5k GIS layer.
2. Trends data is for the area of Cape Cod, Boston Harbor, Nantucket Island, Martha's Vineyard Island, and the Elizabethan Islands only from the effective period of 1893 to 1995.
3. Trends in SRV based on preliminary analysis of changes in eelgrass abundance from 1993-96 to 1999-2002.
4. Includes all vegetated tidal and non-tidal wetlands (i.e. does not include SRV or tidal flats) in GIS mapped protected open space (ownership varies).
5. Data developed by Wetlands Restoration Program. As restoration processes vary in response time, the term “under restoration” is used as a more accurate substitute for “restored”.

2. Provide a qualitative description of wetlands status and trends based on the best available information. Identify ongoing or planned efforts to develop quantitative measures.

As communicated in the 2001 §309 assessment, efforts to determine wetland resources extent and trends have been independent and isolated, offering only partial glimpses to the state of these critical resources. Additionally, much of the work to date has been exclusively focused on wetlands quantity with little to no

attention being paid to wetlands quality, or condition. Therefore, one of the most significant changes since the 2001 assessment is the initiation of a comprehensive estuarine marsh trends identification effort and ongoing work to develop and implement coastal wetland assessment methods. If funding and resources are available, CZM intends to develop a complete assessment of estuarine marsh trends from 4 periods (late 1990s, 1970s, 1950s, 1890s), working in a phased approach by evaluating a different geographic area each year over the next several years. In cooperation with the U.S. Fish and Wildlife Service and the University of Massachusetts, the first estuarine marsh trends investigation focused on the study area of Cape Cod, Nantucket Island, Martha's Vineyard Island, the Elizabethan Islands, and Boston Harbor. Data from this first of a series of trends investigations are included in Table 1. Trends evaluation work started for the North Shore area (from Boston to the New Hampshire border) in Spring 2005 and should be complete by Winter 2005.

Another important data source for current status and trends includes the Massachusetts Department of Environmental Protection's Wetland Conservancy Program who has launched a project that uses remote sensing to discover wetlands violations. Using computer software to discriminate differences in image patterns from wetlands in 1990s and then from recent aerial photography in 2001, suspect areas are given a closer look by photo-interpreters and then likely candidates are field verified. Most of the violations discovered through this process have been freshwater wetlands, and to date over 85 enforcement actions have been taken resulting in fines over $2 million.

Since the 2001 §309 assessment, the comprehensive mapping efforts for estuarine submerged rooted vegetation (SRV) have completed a project to re-map SRV resources of the entire Massachusetts' coastline. The new map of SRV distribution (1999-2002) updated the initial statewide map produced in 1993-1996. The mapping effort was conducted with the financial and technical assistance from NOAA's Coastal Change Analysis Program and the Coastal Services Center. The updated map is not yet published for public release but was distributed to resource agencies.

As identified in the 1996 and 2001 §309 assessment, SRV resources are in dramatic decline. The updated map (1999-2002) demonstrated a further loss in eelgrass coverage (as noted in Trends of Table 1). The historic abundance of eelgrass was significantly greater than shown in the 1993-1999 map, exacerbating the trends of eelgrass loss shown from the two contemporary mapping efforts.

Mapping is an effective method to show landscape changes in eelgrass habitat, and CZM identified the need to complement mapping with fine-scale monitoring in the 2001 §309 strategy. CZM initiated a §309 project in 2002 to investigate the feasibility of an approach to monitor eelgrass habitat. This pilot investigation quantified human disturbance in Salem Sound (northern Massachusetts Bay) and among the project findings was that a relatively large area of eelgrass habitat was lost from 1995 to 2002. By quantifying the relative health of the plants (e.g., presence/absence, depth, shoot density, length and width, and wasting disease), the status of eelgrass habitat in a particular coastal embayment was established and subsequent monitoring will detect changes. This will help provide a mechanism to relate anthropogenic inputs to the relative health of estuarine areas.

3. Characterize direct and indirect threats to coastal wetlands, both natural and manmade.

In terms of direct and indirect threats characterization, both types continue to be of significant concern to coastal wetland resources (Table 2). While direct threats to most wetland resources have largely been eliminated or severely curtailed by state and Federal regulatory programs, eelgrass resources in particular remain susceptible. Direct impacts from boat operation, docking/mooring, harvesting of shellfish, and permitted activities such as pipeline installation, still affect adversely eelgrass resources. Indirect threats, including excessive nutrient and sediment inputs via nonpoint sources and stormwater discharges,

alterations to hydrology, and the spread of invasive species continue to significant threats to coastal wetland and eelgrass resources, resulting in the loss of ecological integrity and reduced function and value.

Table 2. Threat characterization

Threat	**Significance**
Development / Fill	Low
Alteration of hydrology	High
Erosion	Low
Pollution	Medium/High
Channelization	Low
Nuisance or exotic species	High
Freshwater input	Medium
sea level rise	Medium
Nutrient enrichment	High
Sedimentation	Medium/High
Recreational boating / mooring scarring	High

Management Characterization

1. Within each of the management categories, identify Changes since last assessment

Since the last assessment, several changes to management categories have occurred; these are outlined in Table 3, and for categories that have a "moderate" or "significant" change given, further described in narrative below.

Table 3. Management characterization.

Management category	**Changes since last assessment**
Regulatory program	Moderate
Wetlands protection policies / standards	Moderate
Assessment methodologies	Significant
Impact analysis	None
Restoration / Enhancement Programs	Significant
Special Area Management Plans	Moderate
Education / outreach	Moderate
Wetlands creation programs	n/a
Mitigation banking	n/a
Mapping / GIS / tracking systems	Significant
Acquisition programs	None
Publicly funded infrastructure restrictions	None

<u>Regulatory Program and Wetlands Protection Policies</u>

No major regulatory changes have occurred between 2001 and 2005, though small changes to regulations, policies and standards have been made. In 2005, DEP included language in the re-issued Army Corps of Engineers' Programmatic General Permit which included some tight standards pertaining to the location, siting, and construction of stream crossings (including tidal streams). Revisions to the state's Wetlands Protection Act regulations that went that into effect in March 2005 include a notable change in the review of projects in the buffer zone, with those outside the 50 foot buffer zone meeting certain criteria eligible

for simplified review and permitting. During a time of limited resources, the state agency focus has been on primarily on technical assistance and guidance as well as enforcement. The remote sensing for wetlands violations (described above) has resulted in significant cases and settlement awards.

Assessment Methodologies

As described in the 2001 §309 assessment, CZM continues to work on wetland assessment projects developing and applying methods and tools for assessing the condition and quality of salt marsh wetlands. The goals of these projects are to develop and evaluate techniques for assessing the ecological integrity of coastal wetlands, transfer techniques to interested parties, and convey results to decision-makers. Descriptions and reports from projects from 1995 to 2004 can be found on CZM's website at http://www.mass.gov/czm/wetlandassessment. htm.

Currently, CZM is working in partnership with the MassBays National Estuary Program and the US EPA's Atlantic Ecology Division on a watershed-based coastal wetlands assessment project. The project study area is three major coastal watersheds, covering about 1/3 of the entire coastal watershed of the state. The three-tier approach for this project includes a Landscape Assessment (Level 1), a Rapid Assessment (Level 2), and an Intensive Site Assessment (Level 3). As of Fall 2005, CZM has completed the Level 1 and Level 2 assessment at about 46 randomly selected and targeted sites, generating data on characterization, disturbance, and condition indicators.

Restoration / Enhancement Programs

A major change to the CZM program occurred in 2003, when the state's Wetlands Restoration Program was transferred to CZM during an EOEA-wide restructuring of certain agencies and programs. Founded in 1993, the Wetlands Restoration Program coordinates all aspects of wetlands restoration, including the identification of potential restoration sites; the assessment of project feasibility; the development of regional plans; the oversight of design, engineering, permitting, and construction; and the confirmation of adequate monitoring. The WRP works as a networked program in collaboration with restoration project sponsors, State and Federal partners (including Coastal America), and the Corporate Wetlands Restoration Partnership. Currently at CZM, the program is focused on two types of projects:

1. Coastal inter-tidal or formerly inter-tidal wetlands
2. Brackish or freshwater wetlands that are associated with coastal rivers and streams as well as anadromous fish runs.

To date, the Wetlands Restoration Program has completed 43 projects for 520 acres under restoration. Currently the Program is working with various partners on 35 priority projects for over 3,000 acres of restorable wetlands.

The addition of eelgrass as another target habitat restoration type is the next big step for the Wetlands Restoration Program and a direct nexus to the assessment and planning work conducted under CZM's past 309 sponsored efforts (FY03 Seagrass Quality Assessment; FY05 Seagrass Planning). While still a relatively "new" area, eelgrass restoration (including techniques, methodologies, and associated policies and guidelines) is quickly gaining well-deserved attention. CZM's project to test eelgrass habitat monitoring approaches complements the existing mapping efforts of the Wetlands Conservancy Program and the Massachusetts Estuaries Project by providing the foundation to detect and understand fine-scale changes in the status of eelgrass. Guidelines to monitor eelgrass habitat will be transferred to a variety of coastal interest groups, such as resource managers, scientists and volunteer monitors. In addition to the monitoring initiative, CZM is developing a habitat suitability model for eelgrass in partnership with the University of New Hampshire to quantify the extent of suitable eelgrass habitat, locate suitable habitat that supports and does not support eelgrass, and guide the siting of potential restoration projects.

Eelgrass restoration is gaining popularity, as water quality improves in coastal Massachusetts. Waters in Massachusetts Bay have seen particular improvements in water quality with the removal of direct discharge of wastewater and mitigation of storm water. The Massachusetts Division of Marine Fisheries started a restoration project in Boston Harbor in 2004 to evaluate the feasibility of planting eelgrass habitat.

Special Area Management Plans

Since the last 309 assessment, CZM has been involved in several wetlands planning projects located in Areas of Critical Environmental Concern. A coastal aquatic habitat restoration plan is also being prepared for the Parker River/Essex Bay ACEC and Great Marsh area on the North Shore. CZM's Wetlands Restoration Program is working to coordinate this effort to inventory restoration opportunities for salt marsh sites and eelgrass habitat. The overall goal of the plan is to help coastal communities identify and prioritize valuable restoration opportunities that can be implemented with assistance from State and Federal restoration partners. To date, WRP has identified several hundred potential restoration salt marsh sites in the study area and will complete preliminary reconnaissance of those sites by the end of 2004, providing detailed information to be used to evaluate restoration potential and promote project development (where appropriate). Also work is underway in the early stages of the development and application of an eelgrass habitat suitability model. The restoration plan will be web (Internet)-based and digital, with additional distribution by CDs.

The 2002 *Rumney Marshes ACEC Saltmarsh Restoration Plan* identifies 16 wetlands restoration projects (totaling 120 acres) and documents 14 completed projects restored in recent years (totaling 140 acres). Restoration projects are being prioritized and implemented using this plan.

Guidelines for Walkways and Stairways in Fresh and Marine Resource Areas in the Pleasant Bay ACEC were completed with input and review from CZM. These guidelines are intended for use by local conservation commissions and planning boards in the review of permit applications for walkways or stairways over marine or freshwater wetland resources.

A Natural Resource Management Plan for the barrier beach located in the Barnstable Harbor/Sandy Neck ACEC was developed in 2002 for the Town of Barnstable. The plan is intended for use by the Town as a guidance document for making short and long-term management decisions at Sandy Neck. In addition to providing management alternatives and recommendations, the plan contains background information about a variety of natural resources at Sandy Neck including beach, dune, salt marsh, and bordering vegetated wetlands.

Mapping / GIS / Tracking Systems

As previously described, efforts to capitalize on technology through GIS and remote sensing have been significant. For one, the estuarine marsh trends projects rely heavily on this technology—from the scanning and geo-rectification of historical maps and aerial photos to the on-screen interpretation of wetlands signatures. The current wetlands assessment project also uses GIS and ortho-base imagery to examine and generate data for landscape level indicators, including land use in the buffer zone, fragmentation and filling, aquatic edge, and ditching / diking. DEP is using image processing software and GIS to identify wetland violations from aerial photography. DEP is also proposing to develop an electronic mapping system that will combine varied databases and visually present data compilations of the Massachusetts Wetlands Protection Program. Existing databases include data from ongoing wetland permitting, enforcement, mitigation activities and aerial reconnaissance wetland change mapping. The electronic database mapping will integrate existing databases and allow DEP to track and distinguish permitted wetland losses from wetland sites involving illegal fill. Finally, through the development of

several web sites and list-serve updates, the outreach and education components of wetlands restoration. With the program move, the WRP website was completely redeveloped and redesigned and went online in December 2003 (see http://www.mass.gov/czm/wrp/index.htm). In addition to CZ Mail, the WRP also sends periodic programmatic updates (see http://www.mass.gov/czm/wrp/education/currentupdate.htm).

Conclusion

1. Identify priority needs or major gaps in addressing programmatic objectives for this enhancement area that could be addressed through a 309 strategy.

Despite strong regulatory protection programs and the recent success of the Wetlands Restoration Program, two primary issues are of considerable concern for coastal wetlands in Massachusetts. The first is the legacy of historical impacts. Before strong, institutional protection existed for wetland resources, significant areas of coastal marshes, as well areas of tidal flats and eelgrass beds were lost—permanently destroyed by upland fill, dredging projects, and coastal engineered structures (like docks and groins). In some cases, we know where these areas are, but our general understanding of the trends of these resources is significantly lacking. Completing the estuarine marsh trends work for the entire coast is critical to give us a complete picture of coastal wetlands trends over the last century, identifying areas of losses, gains, and changes in type, and pointing to specific areas where restoration efforts could be focused.

For salt marshes, restoration efforts are in full swing. Ample coordination exists between local, State and Federal agencies and groups. While sometimes incomplete and subject to periodic shortfalls, funding sources for restoration are generally on the rise (but so too is competition between projects and jurisdictions). The scientific understanding of the technical aspects and ecological responses of salt marsh restoration is increasing. Eelgrass restoration, however, is in its infancy in New England. Continued research and small-scale restoration are important steps in determining the appropriateness and fate of this management technique. Therefore, integrating eelgrass as another target habitat type for the Wetlands Restoration Program would increase capabilities and resources, lead to improved understanding of restoration techniques, address policy issues associated with loss and restoration of this habitat, and ultimately result the public and natural system benefits of restored acres of eelgrass.

The second primary issue in the wetlands area is the continued trajectory towards loss of wetland quality, or condition. While the physical area of these resources may be relatively stable (i.e. small permitted losses being offset by both mitigation, proactive restoration, and natural gains), their cumulative functions and values are in decline from impacts associated with hydrological alterations (particularly, tide restrictions), excessive pollutants (particularly nitrogen eutrophication), and disturbances from invasive species. To better understand where these functional losses are occurring and the ecological effects of this degradation, more investment—in terms of both capital resources and in policy applications—is needed in the continued development and utilization of assessment methodologies. After completion of the current coastal wetlands assessment project (described above), CZM will be able to report on (at a basic level) the condition of coastal wetlands for nearly one-third of the coastal watersheds. The transfer of this approach to other coastal watersheds and to other states should be a high priority for CZM and other agencies, but resource limitations will be an obstacle. The current work is supported until 2006 by a pilot grant from US Environmental Protection Agency.

It is imperative that Massachusetts continues its efforts to determine areas where coastal eutrophication is especially problematic, quantifying existing and predicted loads, and identifying feasible load reductions. DEP's Estuaries Project is successfully providing the first part of this information base, with the development of Total Maximum Daily Loads (TMDLs) for specific embayments. The implementation of

these reductions (nitrogen and bacteria) will be a major challenge, requiring significant staff for local assistance and inter-agency coordination as well as capital investment in infrastructure and BMPs.

The threat and actual proliferation of non-native, invasive species will continue to be a serious concern for coastal wetlands. When stressed by human disturbances, the competitive abilities of natural communities are jeopardized, and colonization by invasive species can occur quite rapidly. Invasive species can add to ecological degradation by altering natural processes and reducing biodiversity. Documenting the existence and spread of invasive species and determining the most effective and least disruptive control method are critical steps in the invasive species management effort.

2. What priority was this area previously and what priority is it now for developing a 309 Strategy and designating 309 funding.

Last Assessment: **High** This Assessment: **High**

Coastal wetlands are extremely for Massachusetts providing valuable services for humans and serving as critical habitats for coastal ecosystems. Ensuring existing levels of wetlands protection and developing new strategies to preserve and restore wetlands is a central focus of the coastal program. Despite considerable progress, there is still substantial work to be done for the Wetlands Restoration Program. Integrating eelgrass restoration and continuing to conduct pro-active restoration site inventories and planning will be the next big steps.

Ensuring the continuation of and institutionalizing the development and utilization of wetlands assessment methods is a high management priority. The applications of assessment methods are many and include: comparisons of functional equivalency (for both compensatory mitigation and pro-active restoration), trends reporting, status for condition reporting, and restoration site identification. With increased availability and use of technology—including aerial and underwater data, remote sensing, GIS processes and techniques, and database management and access—comes better and more-readily accessible information for coastal managers. Finding the necessary resources to make meaningful accomplishment towards addressing the sources and impacts of coastal eutrophication and hydromodifications will require significant work, renewed coordination, and new partnerships.

Wetlands: Strategy

Program Change Overview

The wetlands enhancement strategy for 2005 consists of three distinct projects, all of which relate to a major CZM program change involving formal incorporation of the Massachusetts Wetlands Restoration Program (WRP). This program was founded in 1994 to support voluntary, pro-active restoration of degraded or former wetlands and, in July 2003, was transferred to CZM from its former host, the Department of Environmental Protection (DEP), in order to enhance coordination and to capitalize on CZM's coastal expertise. The realignment provided CZM with new and important resources, capacities, and authorities, and allows WRP to completely integrate and synchronize its efforts with CZM's program areas, as well as with the two Massachusetts National Estuary Programs—the Massachusetts Bays Program and the Buzzards Bay Project.

Through specific actions and efforts described below, CZM will: 1) institutionalize the Wetlands Restoration Program as an integral part of the networked Coastal Program; 2) expand the types of habitat

covered by the Wetlands Restoration Program to include eelgrass beds (or submerged rooted vegetation); and 3) integrate WRP activities with ongoing work on wetlands monitoring efforts, specifically in regards to functional assessment and status and trends.

Project 1: Institutionalize the Wetlands Restoration Program

Summary of Enhancement Tasks

To formalize the integration of the Wetlands Restoration Program into the CZM Program, several tasks are proposed:

1. A detailed description of the Wetlands Restoration Program will be submitted to OCRM, containing narrative of how the program:
   a. connects with the CZM program, including its other programs, its enforceable policies, and its network of State and Federal agencies;
   b. relates to State capital and fiscal planning, with past years, current year, and forecasted budgets for operation, staff, and grants;
   c. relates to NOAA grants, with past years, current year, and forecasted budgets;
   d. coordinates and builds on public-private partnerships through the Corporate Wetlands restoration Partnership;
   e. provides technical assistance to constituents, including local cities and towns, regional groups, NGOs, and private landowners;
   f. conducts regional and watershed planning to identify restoration opportunities;
   g. provides comprehensive project management, including project feasibility analysis, design and permitting, construction oversight, and site monitoring and assessment; and
   h. delivers outreach and educational resources.

2. A portfolio of past and current projects will be developed, including examples of representative restoration projects as well as descriptions and examples of regional restoration plans. Further, a geo-database of all WRP projects will be developed to enable GIS or database querying and analysis. The list will be updated annually.

3. A WRP Coordinating Committee will be convened twice a year, representing:

US Army Corps of Engineers	MA River Restore Program
US Environmental Protection Agency	MA Division of Marine Fisheries
Natural Resources Conservation Service	MA DEP Wetlands
National Oceanic and Atmospheric Admin. ion	Massachusetts Audubon Society
US Geological Survey	The Nature Conservancy
US Fish & Wildlife Service	Ducks Unlimited
Executive Office of Environmental Affairs	Corp. Wetlands Restoration Partnership

Agenda items will vary but the focus of the meetings will be on maintaining and improving coordination and collaboration.

Project Appropriateness and Likelihood of Success

The restructuring of the coastal restoration program within CZM is a logical organizational change and capitalizes on the agency's unique position as the State organization whose express focus is technical assistance to coastal communities and their natural resources and habitats. While integrated within the coastal program, restoration efforts would continue to operate on the partnership approach, which demands and realizes close coordination and resource sharing between other State and Federal agencies, local project sponsors, non-governmental groups, and the private sector. The project has a very high

likelihood for success as the need for coastal wetlands restoration has been well documented. CZM has inherited and is further developing a coastal restoration program to meet these needs.

Work Plan and Estimated Costs

This will be a one-year project with a budget of $40,656 to cover ½ time of the WRP Coordinator plus fringe and indirect.

Project 2: Addition and Integration of Eelgrass Habitat Restoration to WRP

Summary of Enhancement Tasks

Since its inception in 1994, the focus of the Wetlands Restoration Program projects has been on salt marshes and wetlands that border documented anadromous fish runs. Massachusetts has lost about 28% of its original wetlands, and about 16% of its salt marshes. In addition to these physical losses, coastal development and the indirect impacts from hydromodifications and eutrophication have resulted in thousands of acres of degraded habitat and lost functions. Submerged rooted vegetation—or eelgrass (*Zostera marina*)—as a habitat, has suffered a similar fate. While trends numbers are not readily available (due to difficulties associated with mapping and tracking these submerged resources), the information base is sufficient to conclude that coastal areas have suffered significant losses and continue to be at great risk. For example, eelgrass mapping in the late 1990s and early 2000s by the MA DEP Wetland Conservancy Program showed tremendous loss of eelgrass habitat in shallow waters throughout Massachusetts, particularly in bays of southeast Massachusetts. CZM has maintained long-term interest and has developed considerable expertise in this costal habitat.

Using the experiences and lessons we have gleaned from ten years of salt marsh restoration efforts as a model, CZM is proposing to integrate eelgrass habitat restoration into the Wetlands Restoration Program. The integration would include continuation of the eelgrass restoration site planning efforts recently launched by CZM in the Great Marsh and an initiation of several pilot restoration sites. The integration would also involve coordination with state and federal agencies, municipalities, and regional organizations. Furthermore, this project will begin to coordinate the development of an eelgrass management plan to ensure the long-term conservation and restoration of eelgrass habitat.

Tasks for this part of the Wetlands Enhancement Strategy are:

1. Conduct feasibility of sites identified in the Great Marsh planning process and application of the habitat suitability model (see Assessment: Special Area Management Plans).
    a. From the initial model run, use the top-ranked sites for further evaluation.
    b. For this subset of potential restoration sites, develop the detailed site-specific data for a second, more explicit model run.
    c. Identify 4-6 areas with greatest feasibility for restoration.
    d. Locate a source for donor eelgrass: could be local or regional eelgrass beds with stable populations and/or eelgrass cultured in farm tanks.
    e. Engage agencies/constituents and others to generate consensus for preferred sites.
2. Implement pilot eelgrass restoration project(s).
    a. Develop site plan(s) with all necessary details including site characteristics (depth, tide range, exposure, currents, range of light penetration, ambient water quality conditions, substrate, etc.), planting specifications, timing, logistics.
    b. Conduct pre-application permit meetings.
    c. Locate and apply for grant and other funds to support restoration work.
    d. Finalize plan(s), obtain permits.
    e. Harvest eelgrass and/or seeds and plant site(s).

f. Periodically monitor the progress of restoration site(s).

3. Coordinate eelgrass restoration and related management efforts. As noted in the Ocean Resource section, strategies to improve the management of estuarine and marine habitats are needed to support the development of comprehensive ocean and coastal resource management plans and restoration efforts are a component of a thorough approach to manage eelgrass habitat.

a. Coordinate an inter-agency seagrass technical team; meet periodically to discuss individual projects and plan for coordination of future endeavors.
b. Add eelgrass restoration and management sections to CZM website.
c. Initiate the development of a management plan for eelgrass, which could include identification of a work plan and timeline, criteria and data standards used to delineate area-based management strategies, monitoring protocols, restoration techniques and review of existing habitat management models.

Results and lessons learned from this project will guide future efforts to restore eelgrass habitat and this restoration planning effort will ultimately be transferred to a new region.

Project Appropriateness and Likelihood for Success

Eelgrass meadows are an important habitat in the coastal marine ecosystem. They provide primary production that supports numerous species and serve as nursery, shelter and forage areas for numerous finfish and invertebrates. Loss of eelgrass habitat due to direct physical impacts as well as indirect changes in water quality and substrate types has been extensive. Eelgrass meadows were once prolific in most coastal embayments and shallow near shore areas.

While efforts to better define the management and protection options for eelgrass resources have increased recently (see discussion of Estuaries Project in assessment above), there has been very little effort to comprehensively engage in the restoration of former eelgrass habitat and conservation of existing eelgrass habitat. A concentrated effort is critical to bring the appropriate attention and resources to eelgrass restoration and conservation.

Because of its strong experience with coastal habitat restoration through the WRP and its long-term interest and growing expertise in this habitat type, CZM is well-suited to be the appropriate organization to coordinate and spearhead a broad eelgrass restoration effort but emphasis would remain on continued coordination and collaboration with State and Federal agencies as well as regional organizations and local cities and towns.

Work Plan and Estimated Costs

This will be a three to five year project with an annual budget of $78,000:

- $48,800 for 2/3 time of CZM's Marine Ecologist.
- $30,000 for data collection and development, equipment, and supplies.

Project 3: Continue WRP-related Research on Assessment Tools and Trends

Summary of Enhancement Tasks

As explained in the Assessment, information on both wetlands quantity and quality has been scarce and without this information, we cannot effectively discuss issues of "no net loss" or of the ecological integrity of these critical aquatic systems. Some isolated efforts were made in the 1980s and 1990s to examine relatively recent trends in wetlands acreage, but no comprehensive efforts have been made to

document quantity trends on a state- or coast-wide basis. The story for wetlands quality is similar (if not worse).

In an effort to address these data gaps, CZM has been working on two fronts. In 2004, CZM launched a phased approach to document estuarine marsh trends over a 100 year time period. The first estuarine wetlands trends investigation was recently completed and covered the study area of Cape Cod, Nantucket Island, Martha's Vineyard Island, the Elizabeth Islands, and Boston Harbor. The second phase will soon be complete for the North Shore area (from Boston to the New Hampshire border). On the second front, CZM continues to work on wetland assessment projects to develop and apply condition assessment tools for estuarine wetlands. Currently, CZM is testing the application of two levels of wetlands assessment in selected coastal watersheds. A landscape level assessment is done using GIS data layers and analyses; and a rapid assessment is done using the first draft of a Rapid Assessment Method For Characterizing the Condition of New England Salt Marshes, developed jointly by CZM, the Mass Bays National Estuary Program, and the US EPA's Atlantic Ecology Division.

In the wetlands assessment and trends project, several new tasks are proposed:

1. Complete the final phase of the 100 year trends assessment of estuarine marsh for the remaining coastal watersheds in Massachusetts, developing the baseline information of estuarine wetlands for 4 points in time: early 1900s, 1950s, 1970s, and 1990s.
    a. The remaining areas are: the South Coastal, the western side of Buzzards Bay (eastern side completed in Cape Cod watershed trends project), the Tauton, the Ten Mile, and the Narragansett Bays watersheds.
    b. A report will be developed for this last phase of the trends work and made available via CZM website.
    c. GIS data (and metadata) will be developed for each time period estuarine wetlands base, and a trends layer for each time period (i.e. Historical>1950s, 1950s>1970s).
2. The source imagery for this new estuarine wetlands trends work as well as the previous two phases will be developed into new GIS ortho-image data. The imagery will be digitized, rectified, and mosaiced to generate seamless base imagery for these time periods for the tidal portions of all coastal watersheds.
3. Continue coastal wetlands assessment implementation efforts and develop guidance:
    a. Publish *Rapid Assessment Method For Characterizing the Condition of New England Salt Marshes* document on CZM website and work with related agencies/organizations to disseminate;
    b. Implement assessment efforts in new coastal watershed (to be determined); develop local and regional capacity to assist with rapid assessment implementation;
    c. Integrate results into wetlands condition geo-database; make available to interested parties;
    d. Develop key findings and points summary for CZM website, including overall condition index, data for individual metrics (e.g. percent / number of wetlands with invasive species, with high level of stressors in buffer, and fragmented).

Project Appropriateness and Likelihood of Success

Through this project CZM intends to improve its coastal program effectiveness by completing the baseline trends information and wetland assessment tools with which we can successfully measure our efforts in wetlands protection, conservation, and restoration. These tools and information will provide critical data to support: determinations on wetland loss and gains rates, comprehensive reports on wetland condition, identification of degraded wetland sites and restoration opportunities, evaluation of restoration response, and the tracking of the spread on invasive species. The tools and information are easily transferred to interested parties, with an emphasis on coastal wetland decision-makers like local Conservation Commissions and the DEP. The information generated by this project will also directly

support efforts (such as OCRM has recently launched) to develop and use indicators to track and report on environmental conditions and programmatic progress. CZM has the wetlands and GIS expertise to successfully implement this enhancement project.

Work Plan and Estimated Costs

This will be a three-year project with an annual budget of $42,450 for 2/3 time of CZM's Coastal Habitat / GIS Specialist and a one-time cost of $60,000 for a consultant to conduct remote sensing, photo-interpretation, and GIS data development.

Programmatic Objectives

I. Develop and enhance regulatory, planning, and intra-governmental coordination mechanisms to provide meaningful state participation in ocean resource management and decision-making processes.

II. Where necessary and appropriate, develop a comprehensive ocean resource management plan that provides for the balanced use and development of ocean resources, coordination of existing authorities, and minimization of use conflicts. These plans should consider, where appropriate, the effects of activities and uses on threatened and endangered species and their critical habitats. The designation of specific marine protected areas should be considered.

Resource Characterization

1. Massachusetts ocean resources and uses, threats / conflicts, degree of threat and anticipated threat(s).

Resource or Use	Threat or Conflict	Degree of Threat	Anticipated Threat or Conflict
Estuarine and Marine Habitats	Human activities including physical alterations (e.g., cable and pipeline development, offshore construction, dredging and dredged material disposal, sand and gravel mining, and fishing techniques) along with the degradation of water quality alter seafloor and water column habitats.	High	Increasing number of proposals to develop the ocean environment for energy generation and distribution, extraction of suitable sand/cobble, and bottom-tending mobile fishing gear.
Seagrass	Water quality degradation and physical impacts decrease the abundance and quality of seagrass beds.	High	Continuation of current threats.
Fishery Resources	Overexploitation of target species, by-catch, and habitat degradation result in low populations of harvestable and non-harvestable fishes, crabs and mollusks and altered ecological integrity.	High	Continued perturbation from fishing gear and offshore development and the removal of non-target organisms.
Biological Diversity	Declining biodiversity from fishing activities, coastal development, pollution, exotic species and natural variability.	Moderate	Unknown status of biological diversity limits the assessment of threats/conflicts.
Coastal Development	Watershed and shoreline construction results in direct, indirect, and cumulative impacts.	Moderate	Continued development and redevelopment.
Aquaculture	Shellfish aquaculture continues to grow and siting of operations may establish use conflicts.	Low	Potential conflicts between conservation, aquaculture and fishing.

Harmful Algal Blooms (HABs) and Pathogens	The extent and magnitude of HABs threatens shellfisheries, overall environmental quality, and human health	High	The frequency and size of outbreaks are likely to increase without appropriate management plans.
Dredged Material Management	Maintenance dredging requires suitable disposal sites, techniques and appropriate work seasons. The lack of disposal sites and limited work periods present conflicting environmental, economic and social issues.	High	The lack of appropriate disposal locations and work seasons will hinder port development and utilization.
Sand and Gravel	Shoreline erosion requires management options to protect property, including the investigation to mine the offshore environment.	High	Conflict between mining, fisheries and conservation will intensify with more beaches requiring fill to protect property.
Oil and Gas	The current moratorium on oil and gas development currently protects ocean resources from this use.	Moderate	Reconsideration of the moratorium on oil and gas development in the North Atlantic.
Energy Generation Facilities and Distribution Infrastructure	Proposals to develop areas of the ocean environment for renewable energy generation (i.e. wind farms) and liquid natural gas (LNG) terminals are under review.	High	Continued interest in developing the ocean environment for energy projects.
Endangered Species	Right and humpback whale populations are at critically low levels. There is no thorough assessment of populations of other marine creatures that may be threatened /endangered.	High	Navigation, fishing operations and offshore development pose threats to the survival of right whale (and other lesser-known species).
Invasive Species	Nonindigenous species threaten public, socio-economic, and ecological health of coastal waters and related uses.	Moderate	New invasions and range expansion of established populations threaten native species and habitats.
Waste Disposal	Large volumes (~ 25 million gallons / day) of treated wastewater are discharged into coastal waters, and combined sewer overflows and individual septic systems pollute coastal waters.	Moderate/ High	Combined sewer overflow and septic system remediation affect coastal water quality and habitats.

Ecotourism and Recreation	Whale watching, charter fishing, environmental excursions and personal watercraft use may impact the ocean environment. Increasing development of the ocean environment will also escalate use conflicts.	Low	Increased coastal population may expand potential impacts.
Research and Monitoring	The understanding of the ocean environment is limited by the lack of baseline data, monitoring and targeted research. Inadequate funding for research and monitoring hinders ocean management.	Moderate	No comprehensive program to manage existing monitor efforts will continue to impede resource management.
Seawater extraction and discharge	Entrainment and impingement and discharge of warm water (power plants) and hypersaline water (proposed desalination plants) impact coastal and ocean resources.	High	Increasing proposals for desalination plants and desire to increase energy production will exacerbate existing impacts.

2. Changes in the resources or relative threat to the resources since 2001 assessment.

Ocean resources are temporally and spatially variable and are frequently altered by human activities, resulting in an unclear picture of the causes of changes and the relative threat to ocean resources. Since the 2001 assessment, several issue areas were identified as important considerations and gained more attention, such as estuarine and marine habitat, sand and gravel mining, and energy generation and distribution facilities. Traditional areas of concern, including seagrass, fishery resources, and waste disposal continue to warrant further study to inform the development of management strategies.

The following is a brief overview of the major changes in resources.

Estuarine and Marine Habitat

Awareness of the value of habitat to fisheries productivity and ecological integrity of the ocean environment was heightened by the designation of essential fish habitat (EFH), and resource management strategies are beginning to incorporate the type and status of seafloor habitats into decision making processes. The Massachusetts Office of Coastal Zone Management (CZM) is improving estuarine and marine habitat management by drafting a strategy to map seafloor habitats, publishing a guide to habitat and entering into a cooperative mapping agreement with the United States Geological Survey (USGS). The collaborative started in 2003, and data was gathered or shared by NOAA's National Ocean Service to produce maps for the South Essex Ocean Sanctuary, Boston Harbor and Ipswich Bay (http://woodshole.er.usgs.gov/project-pages/coastal_mass/). The large-scale mapping provides high resolution maps of seafloor geology (bathymetry and substrate type), increases the understanding of the seafloor environment and supports the development of ocean resource management plans.

Sand and Gravel Mining

Property is threatened by increasing frequency of storms and sea level rise. Historic and relatively new coastal development exacerbates issues associated with naturally eroding shorelines. Specifically, shorelines north and south of Boston and Nantucket are threatened by erosion and management options

include beach nourishment. In response, CZM has developed a guide to sand and gravel mining to facilitate management of offshore mining and nourished areas (see also the Coastal Hazards section).

Energy Generation Facilities and Distribution Infrastructure

Projects in the last five years propose to use the offshore environment to generate electricity, potentially impacting the marine environment and presenting a new use conflict. The increase in project proposals, technology developments, and looming issues such as the OCS moratorium resulted in recent agency and public attention focused to energy-related projects and their impact to the ocean environment. (See Energy Assessment for further information).

Seagrass

Seagrass bed distribution and quality dramatically declined during the past several decades, and at an alarming rate in the past five years, as evidenced by the Department of Environment Protection's (DEP) Wetland Conservancy eelgrass mapping program. Degradation of water quality from eutrophication, elevated turbidity, and physical impacts to eelgrass are diminishing the abundance of eelgrass and the suitability of habitat to support the recovery of eelgrass. While the overall trend is discouraging, enhanced wastewater management is improving conditions in particular coastal waters (e.g., Boston Harbor) and initiatives to jump-start eelgrass recovery through active planting are gaining attention.

CZM initiated a project to monitor fine-scale attributes that indicate the status of individual eelgrass beds and identify causes of habitat degradation in 2002 and the DEP initiated the Estuaries Project to identify management options for eutrophication in southeastern Massachusetts. CZM also developed a habitat suitability model, in consultation with the University of New Hampshire, to facilitate eelgrass restoration (see Wetlands Section for further information).

Fishery Resources

Fishery resources in New England remain under great pressure from overexploitation and habitat degradation. Several management plans were adopted by the New England Fishery Management Council, including Amendment 13 to the Northeast Multispecies Fishery Management Plan (e.g., cods and flatfishes). The Massachusetts Division of Marine Fisheries also continued to manage state fishery resources, and published statewide maps of shellfish habitat (with CZM technical/financial assistance).

Waste Disposal

Wastewater discharge for the Boston area was moved from Deer Island (within Boston Harbor) to Massachusetts Bay in 2000, representing a major change to the threat of wastewater discharge. The Massachusetts Water Resources Authority is monitoring environmental resources in Boston Harbor and Massachusetts Bay to demonstrate changes in resources as a result of this change. Management of combined sewer overflow (CSO) also gained attention since the 2001 assessment, with management strategies under development by many coastal municipalities.

Management Characterization

1. *Ocean management programs and initiatives developed since 2001 assessment.*

Program	**Status**	**Funding Source (309 or other)**
Statewide comprehensive ocean management statute	Filed: *An Act Relative to Ocean Resources and Conservation* (Mar 05)	State funds
Statewide comprehensive ocean	Internal interagency discussions related	State funds

management plan or system of marine protected areas	to bill above	
Single purpose statutes related to ocean resources	Regulations for finfish aquaculture (under review)	
Statewide ocean resources planning/working groups	Massachusetts Ocean Management Task Force (2003-2004) State Marine Protected Areas Working Group (April- October 2005) Seagrass Technical Team (2002-ongoing) Massachusetts Scientific Advisory Board Appointed to advise Secretary of Environmental Affairs Aquatic Invasive Species Working Group (2000-ongoing)	309; State funds; Massachusetts Environmental Trust
Regional ocean resources planning efforts	Gulf of Maine Council Summit Gulf of Maine Mapping Initiative (GOMMI) New England Fishery Management Council	309
Ocean resources mapping or information system	Refined Massachusetts Ocean Resources Information System Seafloor Mapping Initiative Conducted Non-Fishing Human Use Characterization in State Waters Completed Massachusetts Marine Managed Areas (MMA) Inventory	309; mitigation; State funds
Dredged material management planning	Developed Dredged Material Management Plan for New Bedford Initiated process to designate Buzzards Bay Disposal Site	Massachusetts Seaport Bond
Habitat research, assessment and monitoring	Seafloor Mapping Initiative Seagrass Monitoring Massachusetts DEP statewide eelgrass map	309, Seaport Bond, NOAA's CSC, mitigation funding
Public education and outreach efforts	Developed Ocean Education Guide Conducted Ocean Attitudes and Values Survey Published CZM's Coastlines dedicated to Estuarine and Marine Habitat	309, Massachusetts Environmental Trust
Aquatic Invasive Species Management Plan	Complete (December, 2002)	NOAA grant

Waste Disposal & Nutrient Management	Massachusetts Estuaries Project (2001)	State funds

2. For identified changes, summarize the change, specify whether it was a 309 or other CZM driven change and specify funding source, and summarize the effect in terms of program outputs and outcomes.

Establishing a Framework for Ocean Management and Planning

In response to development proposals in the ocean environment, Governor Romney initiated the *Massachusetts Ocean Management Initiative* in 2003. The Massachusetts Ocean Management Task Force was charged with reviewing the current status of ocean resources and management measures available to manage ocean resources. CZM, supported in part by 309 funding, guided the effort and managed the 23-member Task Force that included private and public sector individuals, representing relevant state and federal agencies, conservation organizations, industry groups (i.e., recreational and commercial fishing, shipping and marine technology). Federal and state legislators also participated.

The Task Force met over 30 times during a period of ten months, held six public meetings and received over 300 public comments before concluding their work with the publication of *Waves of Change:* (March 2004). The publication included 16 recommendations to improve ocean management. CZM immediately began implementation efforts through the following:

Statutory Framework: In March 2005, Governor Romney filed statewide ocean management legislation, titled, An Act Relative to Ocean Resources and Conservation, which, if passed, would authorize the Massachusetts Secretary of Environmental Affairs to work with state agencies to develop a statewide Ocean Management Plan, resulting in a more effective statutory framework for state agency management of offshore ocean development. The only current state law directed specifically to ocean management is the 35-year-old Ocean Sanctuaries Act, which contains important restrictions (that are carried over in the new legislation), but is limited in geographic coverage, operates on a reactive rather than proactive basis, and lacks clarity in several important respects.

Information Base for Marine Planning: To facilitate the development of an ocean management plan, CZM is characterizing ocean-based human uses. In addition, the Massachusetts Ocean Resource Information System (MORIS), initially created through CZM and NOAA funds, evolved to allow rapid access to ocean and coastal information and data through an interactive, searchable web mapping service.

Marine Protected Areas (MPA) Working Group: In response to one of the Task Force recommendations, CZM staffed a Secretary appointed Marine Protected Areas (MPA) Working Group. The working group was charged with making policy recommendations on an appropriate governance mechanism for MPA planning, but was dissolved in 2005 due to lack of consensus.

Regional Ocean Resources Planning Efforts

CZM participated in regional governance, including ocean and fisheries resources planning efforts. CZM, with support from 309 funding, actively participated in meetings of the Gulf of Maine Council on the Marine Environment, New England Fishery Management Council, Gerry E. Studds Stellwagen National Marine Sanctuary, Census of Marine Life and NOAA's Marine Protected Area Center. Through regional efforts, CZM assisted in resource assessments and management planning, with particular focus on the seafloor environment (e.g., the Mapping Initiative through the Gulf of Maine Council).

With support from NOAA's Marine Protected Areas Center, Massachusetts was the first state in the Gulf of Maine region to complete the National Marine Managed Areas Inventory in December 2004. New Hampshire and Maine began their Inventories in Summer 2005 and upon their completion, this work will set the stage for future MMA-related regional analyses.

Habitat Mapping and Monitoring

CZM published a strategy to coordinate seafloor mapping throughout the state (through NOAA's CSC fellowship program) and a primer to marine habitat. CZM also conducted a pilot project, with support from 309 funding, to complement statewide eelgrass mapping to evaluate the feasibility of a monitoring approach. The pilot project, along with regional mapping projects, are providing information on largely unknown conditions in Massachusetts and demonstrating the value of monitoring and management at a variety of scales and supporting the development of management strategies to conserve estuarine and marine habitats and initiate ecosystem-based planning.

Dredged Material Management Planning

The statewide Dredged Material Management Plan (DMMP) developed a process to manage dredged material, including disposal options for Gloucester, Salem and New Bedford Harbor. DMMP projects were largely funded through the Massachusetts SeaPort Bond. The New Bedford Harbor DMMP was approved and is facilitated the disposal of contaminated dredged sediments, maintenance and improvement dredging and harbor development. DMMP efforts also included a comprehensive resource characterization in support of the (ongoing) designation of the Buzzards Bay Disposal Site.

A report was published, '*Gloucester Harbor Characterization: Environmental History, Human Influences, and Status of Marine Resources*,' as a result of DMMP studies and planning efforts in Gloucester Harbor and partially supported with 309 funding. The report was the first comprehensive assessment of the marine and human environment in Gloucester Harbor in over three decades and provides much valuable information.

Aquatic Invasive Species Management Plan

CZM drafted an Aquatic Invasive Species Management Plan (2002), which outlines a five-year management approach to minimize impacts from aquatic invaders. The plan focuses on prevention and education but also outlines actions to control existing populations, monitoring, and early detection and rapid response. CZM staff created a central repository for marine invasive species data (http://www.MarineID.org). CZM and the Massachusetts Bays National Estuary Program sponsored several publications and workshops to address issues surrounding invasive species and conducted a rapid assessment of invaders, with the MIT SeaGrant Program, in 2003 to build on a 2000 survey.

Waste Disposal & Nutrient Management

The Massachusetts Estuaries Project (MEP), administered by DEP, was a major initiative started in 2001 to protect and restore the estuaries in southeastern Massachusetts. The goal of MEP is to determine the geographic area contributing nutrients to each estuary, nutrient sources and loads, and nutrient loads each estuary can tolerate without altering its character and use (http://www.mass.gov/dep/smerp /smerp.htm). The primary goal of the MEP is to manage (i.e., reduce) nutrient loads to selected estuaries through the development of total daily maximum loads (TMDLs).

Conclusion

1. Identify priority needs or major gaps in addressing the programmatic objectives for this enhancement area that could be addressed through a 309 strategy.

CZM Program Policies to Protect Ocean Resources Need to Be Expanded

CZM's current programmatic policies could be improved by the addition of specific policies to address: (1) habitat protection, and (2) endangered species conservation.

(1) Habitat: Current Habitat Policies may not adequately address marine habitat. Proposals for developing the offshore ocean environment intensified and project review is hindered by the lack of an enforceable habitat policy. A Habitat Policy devoted to the protection of marine habitat would be useful in project review, consistency review, and long-term ocean planning efforts.

(2) Endangered Species: CZM does not currently have a Program Policy related to conservation of endangered species. An endangered species policy would facilitate project review and consistency review. The new policy should include both conservation of the endangered species as well as required habitat(s).

(See Energy Assessment for further gaps in CZM Policies related to ocean uses).

Additional Statutory Authority for Ocean Planning and Management is Needed

No comprehensive statewide ocean management statute exists to manage ocean resources in Massachusetts. In March 2005, *An Act Relative to Ocean Resources and Conservation* was drafted and is currently pending in the state legislature. The new legislation would authorize relevant state agencies to develop a comprehensive Ocean Plan to regulate uses and protect habitats and establish an effective statutory framework for managing offshore ocean development. Upon adoption by the Secretary of the Executive Office of Environmental Affairs and approval by OCRM, the Ocean Plan will be incorporated in the CZM Program Plan. The pending act will update existing laws, such as the Ocean Sanctuaries Act, to facilitate proactive planning for ocean resources.

An Improved Information Base for Ocean Planning and Management is Needed

Adequate information and data are needed to guide the development of new regulations/plans or support the revision of existing regulations. Detailed maps of the seafloor and a study of human uses of the ocean environment are particularly valuable data that would facilitate the establishment of ocean management plans as well as inform other CZM programmatic priorities. In further support of enhanced ocean planning and regulation, a logical next step is initiating a pilot program to manage estuarine and marine habitats, utilizing information available from prior mapping and monitoring programs.

Human Use Characterization: CZM conducted an assessment of (non-fishing) human uses in Massachusetts waters in 2005. The project created a geodatabase framework and basemap for long-term characterization studies. Additional analyses, such as visitor use surveys, public user group workshops and cumulative impact assessments, need to be completed on both statewide and regional levels, targeting specific uses as well as the interactions and relationships between particular uses. An economic profile of maritime industries in Massachusetts has not been conducted in a decade, and current planning efforts use dated or inappropriate data.

Habitat-Based Management: CZM invested substantial resources in marine habitat over the past five years (e.g., strategic plan to map benthic habitats, multiple publications, seafloor mapping, investigations of appropriate habitat monitoring, and initiation of restoration planning), partially funded by 309. These efforts, along with other state efforts such as the Estuaries Project, improved the information base of estuarine and marine habitat and demonstrated the need to establish a strategy to manage estuarine and marine habitats in Massachusetts. Mapping activities particularly provide an excellent foundation for habitat-based management planning. Due to the newly acquired seafloor mapping data and abundance of

available information on marine habitat, and the momentum behind the CZM-USGS mapping cooperative and seagrass technical team (formed in response to past 309 projects), an estuarine and marine habitat classification study should be launched as a pilot to identify criteria and data standards used to classify estuarine and marine habitat and test existing classification systems in Massachusetts. Habitat classification can facilitate the appropriate characterization of submerged resources and guide the use and protection of coastal and ocean habitats. The template developed in this pilot project can be transferred to other regions identified as appropriate candidates for area-based management.

Interpretation of Seafloor Maps: CZM led a major effort to map substantial areas of the seafloor during the past several years and demonstrated the value of applying highly detailed maps to ocean management issues. The Massachusetts Ocean Management Task Force reinforced the need for seafloor maps by recommending the acquisition of high resolution maps to improve ocean management in Massachusetts. In order to apply information in seafloor maps to management decisions, interpretative products and workshops are needed to facilitate understanding of map features to resource managers.

2. What priority was this area and what priority is it now, for developing a 309 strategy and designating 309 funding and why?

Last Assessment: **High** This Assessment: **High**

Ocean resources supported the colonization of Massachusetts and this nation, and continue to support productive maritime industries, coastal communities and marine life. The need for new approaches to manage ocean resources has been emphasized in reports from the US Commission on Ocean Policy, Pew Commission and Massachusetts Ocean Management Task Force. Ocean resources in Massachusetts are under constant threat from a diversity of traditional uses and new ventures. Reliable data is needed to support science-based policies and comprehensive management strategies that balance human use and protection of the ocean environment.

Ocean Resources: Strategy

Program Change Overview

The goal of the Ocean Resources Strategy is to bring about significant program change in the statutory/regulatory framework governing control of ocean development. Projects 1-4 work together to provide a framework for a comprehensive ocean planning and management effort, for which new legislative authority is currently being pursued (as described in the Assessment). However, CZM intends to carry out Projects 1-4 regardless of the fate of pending legislation, in order to provide guidance in the implementation of existing ocean-related management programs and develop new enforceable policies that more effectively utilize existing statutory authority. In addition, in the absence of new legislation, CZM plans to work with the Department of Conservation and Recreation to revise and update the Ocean Sanctuaries Act regulations (Project 5 described below), develop smaller regional or issue-based oceans plans, and continue implementation of the Task Force recommendations.

Project 1: Habitat and Endangered Species Program Policies

Summary of Enhancement Tasks

CZM's Program Policies (http://www.mass.gov/czm/policies.htm), are not adequate for use in consistency review for (1) marine habitat and (2) endangered species protection. The lack of enforceable policies for marine habitat and endangered species hinders CZM's ability to regulate development and plan for conservation in the ocean environment. CZM will develop new/revised policies to fill these gaps.

The following tasks will address the specific policy gaps listed in the Assessment:
(1) Initiate CZM work group for policy development;
(2) Review existing CZM program policies and state authorities and identify statutes and regulations appropriate for basis of new or revised policy development;
(3) Draft marine habitat and endangered species policies;
(4) Coordinate interagency, public and OCRM review of draft policy;
(5) Incorporate policy into Program Plan.

Project Appropriateness and Likelihood of Success

As described in the Assessment, there is strong justification to support the revision/addition of CZM Program Policies, for both protecting ocean resources as well as managing uses. The increasing number of proposals to use and develop the ocean environment coupled with traditional uses demonstrated the need for policy to protect marine habitat and endangered species.

Work Plan and Estimated Cost
Year 1 – Tasks 1-2 @$37,500
Year 2 – Task 3 @ $37,500
Year 3 – Task 4 @ $37, 500
Year 4 – Task 5 @ $37,500
FIVE YEAR BUDGET: $150,000

Project 2: Characterization of Human Uses in State Waters: Regional Assessment

Summary of Enhancement Tasks

In July 2005, CZM completed Phase I of the Characterization of Non-fishing Human Uses in Massachusetts State Waters. Completion of Phase I provided CZM with a basemap and an extensible geodatabase framework to further develop and populate in subsequent studies. In order to fully implement the Ocean Management Task Force recommendation associated with this project, CZM should pursue Phase II, using products from Phase I as a foundation. Adequate information and data are needed to guide the development of new regulations/plans and to support the revision of existing regulations and this project will provide analysis essential to those goals.

For Phase II: Regional Assessment, CZM will identify a discrete geographic study area, such as Boston Harbor, to initiate the Human Use Characterization project. The following tasks will be performed for each selected region:
(1) Assess the attributes of and interactions between ocean uses;
(2) Identify any use conflicts;
(3) Design and administer visitor use survey for selected uses;
(4) Analyze and describe results from visitor use survey; and
(5) Hold public workshops to gather input and communicate project findings.

In the context of the above tasks, the Regional Assessments should include analysis of the dimension of ocean uses (seafloor, water column, water surface, airspace directly above water), as well as temporal information (historic, current, emerging), to describe the trends among uses in the selected geographic

area over time. This should provide a template for future regional use characterization studies and will provide a useful background document for ocean planning efforts, as well as other CZM program areas requiring similar information.

Project Appropriateness and Likelihood of Success
Since August 2005, CZM has already begun to populate the human use geodatabase, is working with the Massachusetts Division of Marine Fisheries on a characterizing the fisheries subset of the human use dataset, and is pursuing a project to assess the state's ocean and coastal economy. To complement these on-going efforts, Phase II: Regional Assessment, should delineate discrete geographic study areas, and for each area, employ the human use database to develop a series of analyses informing ocean planning efforts as well as overall CZM program needs.

The likelihood of success is high. Use Database framework is already developed and the on-going Interagency Ocean Planning Work Group meetings provide an appropriate forum for project guidance. Targeting selected regional areas on an annual basis ensures that this project will be feasible and that adequate time and resources will be spent to analyze each unique region.

Work Plan and Estimated Cost
Year 1 – Tasks 1-2 @$75,000
Year 2 – Task 3 @ $100,000
Year 3 – Task 4 @ $60,000
Year 4 – Task 5 @ $75,000
Year 5- Plan for next geographic area @ $75,000
FIVE YEAR BUDGET: $385,000

Project 3: Habitat Classification Pilot Project

Summary of Enhancement Tasks
The understanding of the value of estuarine and marine habitat to the sustainability of coastal and ocean resources continues to improve, and sonar mapping technologies allow spectacular depiction of seafloor topography and substrate type. Managing seafloor habitat is particularly progressing in Massachusetts through the implementation of regional projects. However, a standardized and accepted estuarine and marine habitat classification system has not been applied to Massachusetts. This project will test NOAA's recently released *Framework for Coastal/Marine Ecological Classification Standard*, (www.csc.noaa.gov/benthic/funding/active.htm.

The following tasks are proposed to test the classification framework:
(1) Establish a working group to guide the development of the study;
(2) Identify an appropriate work plan and timeline to pilot the classification system;
(3) Inventory information, datasets, and maps available and create a geographic information system dataset for the proposed pilot area;
(3) Apply NOAA's habitat classification framework to pilot area;
(4) Draft report that reviews existing habitat classification frameworks (including NOAA's), discusses the applicability of the NOAA classification system to characterize Massachusetts habitats, and identifies information gaps; and
(5) Develop a website to communicate the results of existing efforts to map, classify and characterize seafloor habitats.

Project Appropriateness and Likelihood of Success

New approaches to manage ocean resources are needed to complement traditional measures, as evidenced by the findings of the Ocean Management Task Force, US Ocean and Pew Commissions. Testing a habitat classification framework is a logical step in determining appropriate methods to characterize estuarine and marine habitat and initiate ecosystem-based management. CZM invested substantial resources for the past decade in seafloor mapping. Furthermore, the Massachusetts DEP (e.g., Estuaries Project) and restoration activities by Massachusetts DMF demonstrate the commitment to manage estuarine and marine habitat. Results from this project will inform future habitat characterization projects, such as evaluating management measures required to conserve marine habitat.

Work Plan and Estimated Cost
Years 1-3 -Tasks 1-4 @ $75,000 per year
Years 4- 5 Task 5 @ $75,000 per year
FIVE YEAR BUDGET: $375,000

Project 4: Interpreting Seafloor Maps

Summary of Enhancement Tasks
Efforts to map the seafloor environment are a large step toward a greater understanding of the seafloor environment and ultimately the identification of seafloor habitat. CZM, in cooperation with USGS, is mapping seafloor topography and geology throughout Massachusetts. Interpretive products are needed to apply seafloor mapping data to management. This project will distribute products, such as fact sheets, maps and kiosks at public access points, and communicate results from the seafloor mapping project. Specific tasks include the following:
(1) Develop an outreach plan, including the identification of interpretative products and distribution strategy, to raise awareness of the diversity of seafloor environments;;
(2) Publish interpretative products targeted for audiences ranging in technical expertise;
(3) Coordinate workshop to distribute products and demonstrate seafloor map use in decision-making.

Project Appropriateness and Likelihood of Success
The Massachusetts Office of Coastal Zone Management initiated a seafloor mapping project in 2003 and entered into a cooperative agreement with the United States Geological Survey (USGS), Woods Hole to map substantial areas of the seafloor in state waters (http://woodshole.er.usgs.gov/project-ages/coastalmass/html/currentmap.html). Through this cooperative, seafloor maps are complete or in final stages of preparation for the state waters between the New Hampshire border and Boston Harbor and is contiguous with existing coverage of western Massachusetts Bay, Stellwagen Bank and Jeffreys Ledge. CZM and USGS are also currently scoping seafloor mapping for Cape Cod Bay and submitting proposals to continue mapping for the remainder of state waters.

Work Plan and Estimated Cost
Year 1 -Task 1 @ $75,000
Year 2-3 -Task 2 @ $125,000
Year 4-5 -Task 3 @ $75,000 per year
FIVE YEAR BUDGET: $350,000

Project 5: Enhanced Implementation of the Massachusetts Ocean Sanctuaries Act

Summary of Enhancement Tasks
In the event that a new Ocean Management Act is not enacted in the current legislative term, the CZM enforceable policies and associated DCR regulations implementing the 35- year old Ocean Sanctuaries

Act (OSA) (302 CMR 5.00) should be updated, in order to improve clarity regarding the to the range of permitted and prohibited activities in the state's five Ocean Sanctuaries and to better incorporate scientific understanding of marine ecosystems into the permitting process. However, this project will become moot if the new ocean management legislation is enacted, because the needed programmatic improvements will be accomplished in the context of the comprehensive ocean planning process contemplated by the new legislation.

This project will establish an interagency Work Group to draft a revised set of OSA regulations and a Memorandum of Understanding (MOU) governing protocols for interagency coordination on review of projects proposed in Ocean Sanctuaries. The Work Group will be co-chaired by the Department of Conservation and Recreation (DCR) and the Office of Coastal Zone Management (CZM), and other members will include the Massachusetts Board of Underwater Archeological Resources (BUAR), Department of Environmental Protection (DEP), Division of Marine Fisheries (DMF), Energy Facilities Siting Board (EFSB), and the Massachusetts Environmental Policy Act (MEPA) office. The Work Group will complete the following tasks:

(1) Identify areas for improvement in OSA regulations subject to revision. Specific issues to address include, but are not limited to:
    a. clarification of the Public Necessity and Convenience Test
    b. specification of guidance and/or standards relating to the legislative goal of preventing significant alteration to the ecology or appearance of the ocean
(2) Examine CZM Program Policies for guidance and overlap
(3) Draft revised set of regulations
(4) Develop a Memorandum of Understanding (MOU) governing protocols for interagency coordination on project reviews involving projects proposed in Ocean Sanctuaries. Distribute revised regulations for public and state legislative reviews.
(5) Implement MOU for revised OSA regulations.

Project Appropriateness and Likelihood of Success
This project is a logical progression from the original goal of the Ocean Management Initiative, which, in part, seeks to "draft recommendations for administrative, regulatory, and statutory changes". As described by the Ocean Management Task Force, in their report titled *Waves of Change* (2004):

"…..The OSA and its regulations have generated questions from the regulated community and other permitting agencies with regard to issues of compliance with the OSA. Updating the OSA as part of a wider ocean resource management effort should be a top priority. Even in the absence of new statutory changes, there is a need for updating the regulations implementing the OSA, as well as the need for better coordination among agencies with responsibilities for reviewing projects in existing Ocean Sanctuaries."

Since the conclusion of the Task Force in April 2004, the ocean management legislative drafting process has allowed the Executive Office of Environmental Affairs (EOEA), the Department of Conservation and Recreation (DCR), and the Office of Coastal Zone Management (CZM), to better understand MOSA as well as potential areas for regulatory improvement and clarification, setting the stage for a concerted program change effort.

Work Plan and Estimated Cost
Year 1-2 -Tasks 1-3 @ $75,000
Years 3-4 -Tasks 4-5 @ $100,000
Year 5 -Tasks 6-7 @ $25,000
FIVE YEAR BUDGET: $200,000

Project 6: Regional Ocean Governance (Continuation of Efforts)

Summary of Enhancement Tasks

CZM will continue to work with other coastal planners in the region to share lessons learned and build partnerships on regional ocean goverance issues. CZM is actively working with the Coastal States Organization and the National Governors Association on national initiatives, with the Gulf of Maine Council on the Marine Environment and newly developed Northeast Regional Ocean Council on regional issues, and has been asked to speak about our state ocean management planning process to several groups in our region. Since regional ocean governance work requires on-going CZM staff support for meeting preparations/briefings, travel expenses, and frequent conference calls, specific tasks cannot be determined for a five-year period, yet general yearly estimated costs have been assigned below.

Project Appropriateness and Likelihood of Success

CZM has also met with planners in Maine, British Columbia, Nova Scotia and New Brunswick to discuss different approaches to ocean planning and has initiated dialogue with the governments of Australia and New Zealand. Discussions have centered on public participation, goal setting, data collection and management planning processes. Our long-standing history of active participation in regional forums, such as the Gulf of Maine Council since 1989, illustrates Massachusetts' dedication and commitment to regional governance mechanisms, anticipating success in continued efforts.

Work Plan and Estimated Cost
Year 1- $15,000
Year 2- $15,000
Year 3- $15,000
Year 4- $15,000
Year 5- $15,000
FIVE YEAR BUDGET: $75,000

Programmatic Objectives

Develop and implement special area management planning in coastal areas applying the following criteria to areas with:

I. significant coastal resources that are being severely affected by cumulative or secondary impacts;
II. a multiplicity of agencies and partners that can collaborate for effective planning to address coastal development on an ecosystem basis;
III. a history of conflicting and multiple resource use;
IV. a strong commitment at all levels of government to enter into a collaborative planning process;
V. *a strong state or regional entity able to sponsor the planning program.*

Resource Characterization

1. *Using the criteria listed above, identify areas of the coast subject to use conflicts that can be addressed through special area management planning.*

Since the last assessment, CZM has made advances in Special Area Management Planning in the Area of Critical Environmental Concern (ACEC), Designated Port Area (DPA), and Marine Study Area (MSA) programs. Conflicts addressed by these programs are listed below.

Area	Major conflicts
ACEC – regions with unique natural and cultural resources that are worthy of concern and protection.	· Multiple resource use conflicts such as recreation vs. conservation, development vs. biodiversity. · Government agencies holding statutory authority in ACECs can cause multiple jurisdiction problems. · Diverse partners lack coordination on a regional level. · Local stewardship groups lack resources and technical skills to implement management tools.
DPA – coastal sites for water dependent industries.	· Conflicts develop over land use priorities as a result of pressure for development of non-port uses (especially those related to recreation, housing, and tourism). · Disposal of contaminated sediments from dredging projects is a highly contentious issue that presents conflicts, such as suitability and availability of disposal sites, among stakeholders including municipalities, state and federal agencies, and NGOs.
MSA – systems of marine study areas where research and monitoring are conducted.	· MSAs represent a wide range of overlapping biological, physical, economic, social, and jurisdictional environments. · Conflicts among commercial, recreational, and industrial use include dredging activities, artificial reef placement, dock and pier siting, and boating impacts.

Management Characterization

1. Identify areas of the coast addressed by a special area plan since the last assessment.

Area	Status	309 Involvement
Parker River/Essex Bay ACEC	Development of an estuarine resource management plan for the Town of Newbury, updated five-town regulatory assessment, Parker River Watershed Action Plan, economic study of Great Marsh resources, andGreat Marsh Wetlands Restoration Plan.	$35.5K FY02 – 05
Pleasant Bay ACEC	Completion of five-year update of the Resource Management Plan, guidelines for walkways and stairways in fresh and marine resource areas, and personal watercraft guidance document.	$3,450 FY 04
Sandy Neck/Barnstable Harbor ACEC	Plan implementation with Bridge Creek wetlands restoration and land acquisition projects.	n/a
Rumney Marshes ACEC	Implementation of a 2002 Salt Marsh Restoration Management Plan and an ACEC pollution prevention project.	$19.5K FY02, 03, 05
Weir River ACEC	Completion of a natural resources inventory, open space and public access plan, land acquisition plan, andWeir River Watershed Assessment.	$9,750 FY 03, 04
Weymouth Back River ACEC	Completion of Back River Watershed Assessment.	n/a
Waquoit Bay ACEC and NERR	Five year update of WBNERR management plan in progress.	n/a
Neponset River Estuary ACEC	Completion of Neponset River Watershed Assessment. Development of ecological restoration and contaminant remediation strategies for lower Neponset.	n/a
DPA Planning	No new areawide planning efforts in DPA communities were initiated during this period. Among participants in the Four Port Planning Initiative, the focus was on implementation of existing DPA master plans.	n/a

2. Identify any significant changes in the state's SAMP programs since the last assessment.

Areas of Critical Environmental Concern (ACEC) Program

The Massachusetts Department of Conservation and Recreation (DCR – formerly DEM) administers the ACEC Program and coordinates closely with CZM regarding all coastal ACECs. The overall goal of the

ACEC program is to preserve, restore, and enhance critical environmental resources in the state. Today there are 28 ACECs statewide (14 coastal) representing 241,000 acres (74,000 coastal). CZM has continued to have a strong working relationship with the ACEC program in an effort to strengthen state agency coordination and support Special Area Management Planning. Since the last assessment, Special Area Management Planning has been a high priority for 309 funding with the hiring of an ACEC Coastal Stewardship Coordinator and implementation of Coastal ACEC Stewardship Grants.

The ACEC Coastal Stewardship Coordinator was hired in 2000 to focus on the 14 coastal ACECs by translating scientific information, preparing outreach materials, facilitating community meetings, providing GIS technical assistance, and administering the new Coastal ACEC Stewardship Grant program. CZM annually awards these grants to encourage new approaches for municipal and regional planning in ACECs. Since 2002, the grant has awarded $60K to three towns and six nonprofit organizations working on a variety of proactive planning, outreach, and monitoring projects.

Since the last 309 review, CZM and DCR staff worked together to produce the new ACEC Resource Management Planning Guidelines that was approved by the Secretary of Environmental Affairs and distributed to coastal communities. Resource management plans (RMPs) help communities identify and prioritize issues, projects, partnerships, and actions. The guidelines also assist coastal communities wanting to prepare state-approved ACEC RMPs, which are plans that address tidelands and navigable waterways subject to Chapter 91 jurisdiction. The RMP guidelines are a component of the ACEC Stewardship Guide focused on in the previous 309 review.

CZM staff helped create the ACEC Stewardship Guide, which is a web-based approach that has several components including a suite of planning documents, maps, and a new ACEC Boundary Viewer. This online Stewardship Guide provides a cost-effective way to promote education, outreach, technical assistance, and program implementation for all coastal ACECs.

In addition to these program planning and outreach projects, CZM continues to provide support regarding numerous projects in specific ACECs. These include regional planning and wetlands restoration in the Parker River/Essex Bay ACEC, implementing the 2002 Saltmarsh Restoration Plan in the Rumney Marshes ACEC, assisting land protection efforts in the Weir River ACEC, and providing assistance in implementing the 1998 Resource Management Plan in the Pleasant Bay ACEC.

Designated Port Area (DPA) Program

In the last five years (FYs 2001-05) considerable progress has been made in the implementation of DPA Master Plans in the four major ports outside of Boston Harbor (Gloucester, Salem, New Bedford/Fairhaven, and Fall River), with over $13 million expended from the Seaport Bond to help meet harbor development needs. In addition to approximately $250,000 provided to each port for ongoing administrative and coordination expenses, approximately $7 million has funded dredging projects and another $5.8 has been devoted to land-side infrastructure improvements (covering mostly construction but also some engineering/design and feasibility study expenses).

Apart from these port-specific activities, the most significant changes since the prior 309 Assessment of 2001 have addressed programmatic gaps in outreach and education that were identified at that time. The primary initiatives have been: 1) preparation of an overall DPA Program Guide, including a new set of DPA maps; and 2) preparation of new technical assistance materials, primarily for the benefit of maritime

business owners seeking to diversify use of their DPA properties as a means of contending with increasingly harsh economic conditions, especially in the fishing and shipping industries.

A first complete version of the DPA Program Guide has been drafted and will soon begin the process of internal review. The Guide is intended as a one-stop source of detailed programmatic information, complete with actual case examples and extensive Appendix material. Part One provides the "big picture" on state DPA policy: it explains why it makes good sense to protect DPAs, sets the record straight on some common misperceptions, and describes the concepts and principles that underlie the state's firm yet flexible approach to port protection. Part Two is more of a nuts-and-bolts review of program implementation: it describes the types of projects that are allowable in a DPA under regulations of the Department of Environmental Protection, and also covers CZM's responsibility for updating DPA boundaries and promoting DPA Master Plans to guide future development on an areawide basis. When finalized, the Program Guide will also include a comprehensive redrawing of all eleven DPA boundary maps, using contemporary orthophotos to replace the 30-year old base maps that were often difficult to interpret in relation to individual properties.

With respect to technical assistance, three initial steps have been taken to improve the tools CZM makes available to maritime property owners in a DPA. The completed steps include: 1) commissioning a study of public sector economic incentive programs that currently offer financial assistance to port industries; 2) preparing a guidance document entitled "Waterways Regulations Governing DPA Development" that summarizes the types of projects eligible for state licensing under M.G.L c.91, and includes a detailed technical appendix for computing the extent to which "supporting" commercial and industrial uses are allowable on a given DPA property; and 3) carrying out a pilot project of direct consultation with several maritime business owners in the Gloucester DPA who have a strong interest in diversifying the use mix on their waterfront properties, with the results to be documented in case-study form. Approximately $66,000 of direct 309 funding has been utilized during FY 2003-2005 in support of this overall initiative.

Marine Studies Area (MSA) Program

Since the 2001 assessment, CZM has begun developing a model to research and promote ocean protection with a focus on marine study areas (MSAs), which provide an opportunity for systematic investigations of Massachusetts marine resources, through planned studies, monitoring programs, research support, and assured management and control of sites. The MSA program will identify a system of habitats in which research and long-term monitoring will be conducted to answer environmental questions in support of the state's resource management efforts. To achieve this goal, the following objectives of the MSA program include: 1) promote and enhance marine education and outreach, 2) investigate management measures and ecological responses for study areas, 3) improve the understanding of natural variations in Massachusetts marine environments by promoting research in regulated areas, and 4) develop partnerships with local universities, non-profit groups, federal and state agencies to advance innovative study and monitoring strategies, ecosystem management, and education efforts.

The system of marine study areas will represent a wide range of biological, physical, economic, social and jurisdictional environments. Thus, obtaining the support of local communities and stakeholders affected by a network of marine study areas is of the utmost importance. Developing this system of areas to study marine and estuarine dynamics, promote environmental education and investigate management functions through multi-disciplinary partnering advances the Commonwealth's special area management strategies. This initiative is discussed more fully in the Ocean Resources section.

Conclusion

1. Identify major gaps in meeting the programmatic objectives for this enhancement area.

Inadequate ACEC Program staffing levels and funding for regional planning efforts continues to be a challenge. Municipalities and community groups may have the desire to implement management plan components, but generally do not have the funding or expertise to undertake such projects. Due to funding constraints, the stewardship coordinator and grant program will not be continued in FY07.

- ACEC management has moved beyond its focus of project specific impacts and reviews to involve more proactive stewardship efforts, public education, and planning. However, a new focus is needed to assess and characterize the resources in each area to determine impacts and priority needs for resource management.
- Having drafted a variety of DPA-related guidance materials in recent years, CZM is now well-positioned to undertake a concerted outreach effort -- using the agency website, publications, workshops, and other appropriate means -- to systematically disseminate the available information and advertise our technical assistance capability more widely to maritime businesses and other DPA property owners. Within this constituency, a need also exists to organize a "Friends of the Ports" advocacy group to support state DPA policies and promote local DPA planning/implementation.
- MSA needs are discussed in the Ocean Resources section of this document.

2. What priority was this area and what priority is it now, in the view of the coastal program?

Last Assessment: **High** This Assessment: **Medium**

2. Briefly justify the proposed priority.

Special Area Management Planning remains somewhat less of a priority for 309 funding as much progress has been made since the last assessment in ACEC, DPA, and MSA programs. However, the CZM program is interested in building on progress of these programs and will consider Special Area Management Planning for continued 309 funding. Greater interagency coordination and public awareness have enabled these innovative programs to move forward. By continuing to focus efforts on Special Area Management Planning, the success of these programs and the potential for using them as models throughout the coast is assured if given adequate resources.

Special Area Management Planning: Strategy

The Special Area Management Assessment concluded that the Areas of Critical Environmental Concern (ACEC) and Designated Port Area (DPA) Programs are best positioned to benefit from special area management planning (strategies for Marine Protected Areas (MPA) are discussed in the Ocean Resources Strategy). Since the DPA Program receives significant funding from the state's Seaport Bond, this strategy will include only a short section on DPA strategies while focusing primarily on ACEC management. With respect to ACEC management planning, lack of funding and technical assistance for developing and implementing proactive management strategies continues to be the greatest challenge for preserving these critical coastal ecosystems.

The first of the two projects proposed below will be instrumental in fostering program change in the form of new and revised Special Area Management Plans for the ACECs of Massachusetts, together with improved implementation mechanisms. The second project will produce a set of formally adopted policy guidance documents with respect to the interpretation and application of CZM's enforceable Ports Policy

#3, governing development in DPAs, and is intended also to foster program change in the form of additional local development of DPA Master Plans.

Project 1: ACEC Stewardship Activities

Summary of Enhancement Tasks
In the last five years, ACEC management has moved beyond its focus on project specific impacts and reviews to involve more proactive stewardship activities. Because resources are no longer available to continue funding the ACEC Stewardship Coordinator and Grants, existing CZM staff will continue to provide technical assistance to ACEC communities that are taking an active role in resource management efforts. Projects that promote regional planning, characterization and assessment, and project review will be prioritized whenever CZM program efforts overlap with coastal ACECs. In this way, CZM will continue its partnership with DCR to protect, enhance, and restore ACECs.

The specific tasks to be completed for ACEC Management Planning are as follows:

Task A*:* Develop and Review Management Plan Components
CZM will assist local communities in the review and development of management plan components. In the next five years, additional planning projects, such as CZM's wetlands restoration plans and priority projects, will promote and continue implementation of regional planning efforts in ACECs.

Task B: Characterize and assess ACEC resources
Several new assessment and characterization tools are now available that can be used on a pilot basis to describe ACEC habitats. Some of these tools, as described in the Wetlands and Ocean Resources Assessments, have originated from CZM projects that evaluate wetlands trends, assess wetlands health, map submerged aquatic vegetation, and map offshore habitats and substrate. By cooperating with DCR staff, these products and others can be evaluated to further characterize ACEC resources, promote the significance of these areas, and identify information and resource protection gaps.

Task C: ACEC stewardship case studies In the next five years, CZM outreach staff and regional coordinators will work with DCR to develop case studies to add to the online ACEC Stewardship Guide and the habitat content of the CZM website. By identifying projects or communities that have innovative approaches to resource management, ideas can be transferred to other ACECs and regions of the coast.

Project Appropriateness and Likelihood of Success
The intent of this project is to most efficiently utilize CZM's existing program areas and staff to create new tools for regional planning, characterization, and assessment of ACECs while coordinating with DCR staff. CZM staff will work with the DCR's ACEC Program to implement the three tasks described in the strategy. Each task uses the strengths of existing staff to continue outreach efforts, review projects and plans, and evaluate newly available information and tools with a special area focus.

Work Plan and Estimated Costs
Year 1-5: CZM staff will coordinate with ACEC Program staff to review coastal projects, develop and review management plan components, identify case studies, and evaluate new tools and technology with a special area focus for resource characterization and assessment.

Project 2: DPA Program Guidance

Summary of Enhancement Tasks

Two basic initiatives will be undertaken to improve the outreach elements of the DPA program, as outlined below.

Task A: Dissemination of General Information

Existing draft materials will be vetted further, both internally and with appropriate staff at DEP, and then organized into two primary documents: a "Fact Sheet on DPA Regulation and Planning", both in hard copy and web-ready electronic format, providing a concise program overview and outline/summary of the key provisions of applicable regulations; and a comprehensive "DPA Program Guide" to serve as a detailed reference manual covering the policy underpinnings of the program as well as all its practical aspects, complete with case examples drawn from actual operating experience. The former will become available immediately upon completion, whereas the latter will be "rolled out" at a series of regional workshops for DPA property owners, maritime businesses, and key advocacy organizations. Following the workshops, a series of smaller briefing sessions will be held as needed to answer questions specific to individual sites and/or port communities, and to further build awareness and interest in the DPA program.

Task B: Expansion of Technical Assistance for Use Diversification

To help maritime business owners better understand the opportunities for use diversification on their DPA properties, the next logical step in the progression of CZM's technical assistance effort is simply to publicize it more widely. A presentation at the first available meeting of the Seaport Council would bring the service to the attention of a wide variety of port operators and officials in several communities; and a mass mailing to all DPA property owners -- including a letter of introduction and a copy of the Fact Sheet on DPA Regulation/Planning -- would reach an even wider audience.

A second key element of this task will be the development of an additional technical assistance tool, in the form of a series of more thorough case studies in allowable mixed-use development in DPAs. Assessing the feasibility of hypothetical projects involving specific Supporting DPA Uses on actual properties is beyond the professional capability of in-house staff, so a contractor will perform the work with relevant expertise in development planning and market analysis. The result will be a report that compiles previous site-specific feasibility studies for diversification projects within the DPA system, together with an additional set of "illustrative scenarios" prepared for a new group of 3-5 subject properties, selected in part on the basis of previous consultations with maritime business owners. Such scenarios will include a conceptual site layout in plan view, accompanied by at least preliminary assessment of projected costs/revenues, similar to those which have been prepared in conjunction with various harbor planning documents in DPA communities (e.g. Gloucester, Salem, Quincy, Fall River).

Project Appropriateness and Likelihood of Success

CZM hopes these activities will create enough interest and attract potential members to form an advocacy group that includes maritime businesses and others engaged in port activities. Ultimately, building a robust constituency in support of the DPA program will improve protection of these unique areas and further CZM's mission of promoting special area management. The likelihood of completing the proposed outreach tasks is excellent as most of the guidance material already exists in draft form and needs to be vetted thoroughly both within CZM and with the Waterways Regulation Program at DEP, then compiled into publishable form.

Work Plan and/Estimated Costs

Years 1-2: Complete Fact Sheet(s) and associated web postings, more widely publicize the availability of direct technical assistance to DPA business owners, and contract for the Diversification Case Studies.
Years 3-4: Publish the DPA Program Guide and carry out a series of related workshops and follow-up briefings, with an eye toward facilitating creation of "Friends of the DPAs" organization.
Estimated Costs include $25,000 for publication and workshop expenses and $25,000 for contract work.

Section 309 Programmatic Objectives

I. Enhance existing procedures and long range planning processes for considering the needs of energy-related and government facilities and activities of greater than local significance.

II. Improve program policies and standards which affect the subject uses and activities so as to facilitate siting while maintaining current levels of coastal resource protection.

Management Characterization

1. Identify significant changes in the state's ability to address the siting of energy and government facilities since the last Assessment (e.g., new regulations, guidance, manuals, etc.). Provide the following information for each change:

- *Characterize the scope of the change*
- *Describe recent trends*
- *Identify impediments to addressing the change*
- *Identify successes*

Energy Facilities

The issue of energy facility siting in coastal Massachusetts has continued to evolve and grow in importance. The 2001 §309 Assessment described the results of state legislation in 1998 that significantly modified the regulation of energy facility siting through the Energy Facilities Siting Board (EFSB). The legislation retained EFSB authority to evaluate the environmental impacts of major energy facilities in Massachusetts, including large power plants, electric transmission lines, natural gas pipelines and natural gas storage facilities. The role of CZM in such review is defined pursuant to an existing MOU between CZM and the EFSB and set out in Energy Policy #1, which requires that at least one alternative site in the coastal zone be analyzed and compared for coastally dependent projects (and at least one inland site to be evaluated in the case of noncoastally-dependent projects). In federal consistency review, CZM has retained the ability to require a project proponent to prepare an assessment of alternative sites.

Recognizing that the energy industry was about to increase its activity following the deregulation legislation, the 2001 Strategy included a project, to which CZM applied §309 funding and completed in 2003, for a document broadly assessing the presence of energy infrastructure in the coastal zone and generally reviewing the state and federal regulatory framework governing the industry. The document did not discuss certain recent changes in federal law related to energy facility siting, including:

- the 2002 amendments to the federal Deepwater Port Act (DWPA) of 1974, which extended its applicability to include the storage, transportation, and handling of natural gas beyond state offshore boundaries; and
- the 2005 Energy Policy Act, which reaffirmed the state role in federal permitting of LNG developments pursuant to the Coastal Zone Management Act of 1972.

These enactments served to further highlight the important role of CZM policy in guiding future use of coastal areas for energy-related development.

With state restructuring now essentially complete, significant new issues have arisen in the energy facilities regulatory process as a result of technological advances and ever-increasing demand in both the

electric power and natural gas sectors. In particular, pressure has grown to develop in offshore coastal waters that were previously not considered for facility siting. One example that has attracted national attention is the Cape Wind project, a first-in-the-nation proposal to construct a 130-turbine "wind farm" in the waters of Nantucket Sound lying between Cape Cod and the islands of Nantucket and Martha's Vineyard. Additionally, although not proposed at present, other types of renewable energy projects may give rise to siting-related concerns in the future, such as "wave farms" that could be square kilometers in scale.

In the gas sector, actual development in the ocean waters of Massachusetts has already occurred with the 2004 completion of a 30-mile, natural gas pipeline–the Hubline–extending approximately from Cape Ann to Boston Harbor. Originally built for natural gas arriving from Maritime Canada through the land-side distribution network, the Hubline has led to proposals to import liquid natural gas by ship and off-load at floating terminals at the end of "spur" pipelines feeding into the Hubline. Two such terminals have been proposed in Massachusetts Bay. Finally, an onshore LNG terminal in the city of Fall River–the Weaver's Cove project–has been proposed that includes an on-site storage facility as well as a maritime terminal for offloading purposes.

As the issue of energy facilities siting in coastal Massachusetts has become more prominent, CZM has been presented with significant new challenges. For many offshore projects, CZM is the only state agency with direct regulatory responsibility over site selection, pursuant to federal consistency authority, because projects have been proposed outside of state waters. CZM also has a lead role in state permitting for proposed onshore projects such as the Weaver's Cove LNG proposal, for which EFSB regulation of the siting process is preempted by the FERC under the Natural Gas Act. In these cases where proposed projects are not subject to EFSB jurisdiction, CZM has taken a lead role in requiring project proponents to submit detailed analyses of siting options, including maps of areas where the energy industry deems technology allows for such siting.

A related management challenge has been articulated by the Massachusetts Ocean Management Task Force (OMTF) in a March 2004 report to the Secretary of Environmental Affairs. This report included a proposal for comprehensive new legislation at the state level, with the following statement as justification:

"Recent proposals to construct energy and telecommunications infrastructure and other projects in our ocean waters have revealed gaps, overlaps, and inconsistencies in authority, as well as gaps in the ability of the state to plan for -- rather than simply react to -- certain types of development in the state's oceans.…By requiring the development of Ocean Resource Management Plans, the [proposed legislation] contemplates a proactive approach to managing ocean resources, as opposed to the current approach of reacting to proposed projects on a first-come-first-served basis."

In response to this recommendation, CZM led the drafting of legislation that was filed by Governor Romney in March 2005. The purpose of the bill is to establish a framework for managing offshore ocean development by directing the Secretary of Environmental Affairs to prepare and adopt an Ocean Plan. Upon adoption, the plan would be formally incorporated into the state's approved Coastal Zone Management Program, and no construction or other significant alteration of the ocean planning area could be permitted by state agencies unless such activities (including energy facilities and related infrastructure) conform to all applicable provisions of the plan. [See the Ocean Management Assessment for further discussion.]

With respect to energy development particularly, the proposed ocean legislation includes modifications to existing state law relating to offshore development of power-related facilities. First, the longstanding prohibition on building conventional electric generating stations in the ocean per se would be extended to all state waters rather than limited to waters designated as Ocean Sanctuaries. Second, power generation utilizing renewable energy sources would no longer be prohibited (except in the Cape Cod Ocean Sanctuary), provided such facilities conform to an Ocean Plan and not until such a plan takes effect. Finally, the laying of electric transmission or distribution cables would be subject to the requirement of conformance with any Ocean Plan that has taken effect, rather than being categorically allowable anywhere in the ocean as present law provides.

Government Facilities

CZM is unaware of any plans to site new government facilities in the coastal zone. Environmental changes are being and likely will be experienced at several government installations. For example, clean-up of contaminated groundwater at the Massachusetts Military Reservation on Cape Cod continues. The Otis Air Force Base is on the recently published list of base closures proposed by the Department of Defense through the Base Reuse and Closure process. Redevelopment plans for the Naval Air Station in Weymouth are progressing. However, CZM has maximized the use of available authorities to address government facility siting in a manner that does not presently require enhancement.

Conclusion

1. *Identify priority needs or major gaps in addressing the programmatic objectives for this enhancement area that could be addressed through a 309 Strategy.*

Recent offshore energy proposals and consideration of ocean management legislation have raised new regulatory and long-range planning issues related to energy facility siting. Three important gaps related to the state's ability to address these issues are:

- EFSB authority ends at state waters and, in certain cases where the Federal Energy Regulatory Commission (FERC) has jurisdiction, EFSB involvement is generally limited to intervening in the FERC process. Although CZM maintains its federal consistency role in these instances and has an enforceable energy policy that derives much of its content from EFSB regulations, until now CZM has relied primarily on EFSB staff (via the networking approach) for actual policy implementation and have not developed in-house policy guidance applicable to those projects where EFSB has no jurisdiction Additionally, aspects of the EFSB regulations may not acknowledge potential issues raised by offshore energy facility siting that are different from more traditional, terrestrially based facilities.
- Recent offshore energy proposals have highlighted the need for consideration of energy issues in an ocean management program in the Commonwealth.
- Part of CZM's response to proposed offshore energy projects has been to request that proponents provide a regional context for the proposals, describing the constraints associated with current technology together with reasonably forecasted energy needs as published in various reports. CZM recognizes that its mandate does not include providing energy planning for the region. At the same time, since such projects generally incorporate large-scale effects and impacts, understanding that aspect of such projects is vital in the federal consistency process to provide perspective on the impacts to the coastal zone in light of the project need.

As suggested above, we do not see any current opportunities to affect government facility siting that are outside our current authority.

2. *What priority was this area previously and what priority is it now for developing a 309 Strategy and designating 309 funding and why?*

Last Assessment: **Medium** This Assessment: Medium

CZM has raised the priority of energy facility siting because of:

- the combination of technological advances and increased energy need resulting in proposals for projects not previously seen in Massachusetts, especially offshore; such projects raise new regulatory and planning issues;
- CZM's expanding role in siting decisions and the technical expertise and understanding of the energy industry needed to execute that responsibility;
- the opportunity to develop a coherent long range plan for development and operation of coastal (specifically, offshore) energy facilities and associated infrastructure; and,
- the perception that industry interest in locating energy facilities offshore will occur as onshore land prices and development continues.

Energy and Government Facility Siting: Strategy

Program Change Overview

For the reasons discussed in the Assessment, CZM does not propose any 309 projects related to government facilities. However, since recent energy-related project proposals have raised new issues, CZM proposes two program enhancement projects:

1. Energy Need and Implications for the MA Coast
2. Clarifications to CZM Energy Policy #1

The first project is designed to enhance understanding of the Commonwealth's energy need and the role of proposed projects in meeting this need, with a first phase focus on natural gas. This project is expected to lay the foundation for more effective regulation of energy infrastructure development in the coastal zone, and may result in changes to CZM enforceable policies in support of that goal. The project will create a planning document for regulators, industry, and the public to provide guidance in review of energy projects.

The second project is intended to provide clarity for industry and other interested parties regarding the federal consistency process for energy siting, particularly in those instances where EFSB is pre-empted by FERC or lacks jurisdiction because a project is proposed outside of state waters. Anticipated revisions to Energy Policy #1 would provide clarity to the scope and breadth of the alternatives analysis expected during federal consistency review, and would define the manner in which safety is addressed.

Each project is described more fully below.

Project 1: Energy Need and Implications for the MA Coast

Summary of Enhancement Tasks

CZM is proposing a project to address the evolving energy context described in the Energy Assessment, with a first phase focus on natural gas and a second phase focus on a second energy sector. The objective is to identify the forecasted energy need, explain the role of proposed projects in meeting this need, and discuss facility siting considerations. The project will include a public workshop and result in a report describing:

- Role of natural gas as used by power generators and direct consumers;
- Review of various reports summarizing forecasted growth in gas demand;
- Methods of natural gas delivery into the Massachusetts market;
- Proposed natural gas supply projects, and the manner in which such projects would address the forecasted demand growth;
- The rationale for siting natural gas facilities in or near the coastal zone.

Information resulting from the above tasks will be presented in a workshop setting attended by appropriate stakeholders (agencies, industry, interest groups, etc.). CZM may utilize the information in the report and workshop discussions to develop revisions to CZM's enforceable policies, in particular Energy Policy #1. The second project phase will be similar but focus on a separate energy sector.

Project Appropriateness and Likelihood of Success

Understanding the energy industry is particularly germane presently, given the currently proposed projects that are highlighting the importance of planning for the development and delivery of energy. CZM has a direct role in review of these projects, in some cases a lead role, and is enhancing its cooperative relationships with state and federal regulatory agencies and with the energy industry. CZM anticipates coordinating with appropriate agency and industry representatives on this project to help frame potential gas development projects for use in ocean planning.

Work Plan and Estimated Cost

1. Summarize existing information discussing gas demand from state, federal and local governments, and from energy and transportation industry representatives;
2. Discuss proposed natural gas projects in context of overall gas demand.
3. Organize/facilitate workshop for interested parties to discuss these issues.
4. Prepare and submit project report that contains workshop summary as well as summary of tasks 1-2 above.

Phase 1: $40,000; workshop-related expense: $2000; Phase I total: $42,000
Phase II: $40,000; workshop-related expense: $2000; Phase II total: $42,000
Project total: $84,000

Project 2: Clarifications to CZM Energy Policy #1

Summary of Enhancement Tasks

CZM is proposing a project to prepare revisions and/or clarifications to Energy Policy #1 of the state's coastal management plan. As discussed in the Assessment, recent project proposals have resulted in an enhanced role for CZM in the siting process because of federal consistency, particularly for those projects

where the EFSB does not have jurisdiction. This enhanced role has led to application of the Energy Policy and, as suggested in the Assessment, CZM has identified particular issues to be addressed:

1. Clarify the federal consistency process when the EFSB lacks jurisdiction. CZM proposes developing language for Energy Policy #1 to address this issue.

2. Clarify Energy Policy #1 regarding safety and alternatives analysis. Currently, Energy Policy #1 does not describe the role of safety in federal consistency review. Question has also arisen as to the scope and breadth of issues included in the alternatives analysis as part of the federal consistency process. CZM proposes to develop revisions to the Energy Policy addressing these questions.

3. If necessary, preparation of a guidance document to provide clarification of issues related to federal consistency for industry and other interested parties.

Project Appropriateness and Likelihood of Success

The Assessment outlined certain issues with Energy Policy #1 that have been raised by recent projects. CZM anticipates that the proposed project will address these issues by:

- Providing increased understanding of the role of federal consistency in the overall siting process for energy facilities in Massachusetts;
- Providing guidance for industry in preparing documentation for those types of projects that have not been proposed in Massachusetts previously;
- Creating a guidance document for use by regulators, industry, and the public;
- Resulting in more effective regulation of energy facilities and infrastructure

Because of the current attention focus on energy proposals, this project is anticipated to be a near-term CZM priority. CZM anticipates that this project will improve the federal consistency process for energy facilities. CZM anticipates partnering with the EFSB to draw upon their expertise and understanding of the EFSB regulations.

Work Plan and Estimated Costs

Year 1: Prepare draft policy revisions; Year 2: Finalize policy revisions and submit to OCRM for approval, and prepare associated outreach/guidance documents.

CZM staff would be primarily responsible for this project, although a contractor possibly would be hired to assist in the Year 2 effort.

Budget

Year 1: $20,000
Year 2: $20,000; document preparation: $5,000
Project total: $45,000

Section 309 Programmatic Objectives

I. Develop, revise or enhance procedures or policies to provide cumulative and secondary impact controls.

Resource Characterization

1. Identify areas in the coastal zone where rapid growth or changes in land use require improved management of cumulative and secondary impacts (CSI). Provide the following information for each area:

- *Type of growth or change in land use (e.g., residential, industrial, etc.)*
- *Rate of growth or change in land use*
- *Types of cumulative and secondary impacts*

Land Use Change and Growth

Since 2001, little new data has been generated in Massachusetts to comprehensively assess changes in land use or growth that requires improved management of cumulative and secondary impacts. Land use data, which is most commonly used to track development patterns and watershed scale development impacts, was last updated for Massachusetts in 1999. In addition, the last census occurred in 2000, making more recent quantitative assessments of changes in population growth and density difficult. While this data dates back before the previous 309 and assessment report, projects designed to compile and analyze this data were not completed until after 2001, so some of those results are reported here.

In spite of the lack of statewide assessments, significant work has been done at the watershed and municipal scale to assess cumulative and secondary impacts. Through several grant programs, such as the Coastal Nonpoint Source Control Program, state agencies have worked with towns, watershed organizations, and school groups to identify impacts to coastal habitats and water quality.

The following categories represent major areas of concern as indicated by coast wide and local assessments related to cumulative and secondary impacts:

Residential Development: The best example of a comprehensive assessment of land use is the Massachusetts Audubon Society's report entitled, *Losing Ground, At what Cost?* (2003). This report relies upon the 1999 land use data, as well as census, economic, and other development indicators to draw the following conclusions:

- Massachusetts continued to lose 40 acres per day to "visible" development between 1985 and 1999. Nearly nine out of ten acres lost were used for residential development; 65 percent of this land was used for low-density, large-lot construction. Twenty-four percent of the state's land area was developed as of 1999, compared to 17 percent in 1971.
- A review of more recent development between 2000 and 2002 shows that new residential and commercial construction continues to consume forest and agricultural land. We estimate that an additional 40,000 acres were impacted by both visible and hidden development during that period.
- Average residential building lot sizes have increased 47 percent statewide since 1970, and have more than doubled in some counties.

- Forest loss to development, and therefore habitat loss, was particularly pronounced on Cape Cod and in southeastern Massachusetts. Loss of agricultural land to development was distributed through the I-495 corridor and Connecticut River valley.

Thus it is clear that the Massachusetts coastal zone, particularly the Cape Cod and Southeastern regions, continues to face significant residential development pressure.

Additional studies that evaluated the 1999 land use data were conducted at smaller spatial scales. While these reports do not give us a comprehensive picture of land use change throughout coastal Massachusetts, they do provide an indicator of localized development patterns. For example, a CZM study of land use change in the Parker Watershed (on the Massachusetts North Shore) showed that while rates of residential growth are gradually decreasing in the watershed, low density residential (greater than ½ acre lots) continues to exceed all other development types (residential commercial, and infrastructure) combined. Low density residential accounted for 63 percent of all new development between 1970 and 1999 (with the proportion increasing in later years); the biggest loss was to forested lands, which accounted for a proportionate 60% of the total loss of undeveloped land during these years.

Regulations and By-laws: It has become increasingly apparent that zoning bylaws and subdivision rules commonly adopted by Massachusetts municipalities, such as large lot setbacks and minimum lot sizes, have created a culture of development that is highly detrimental to coastal habitats. These developments often include large paved surfaces in the form of driveways and sidewalks, removal of large forested areas, and high maintenance landscaping practices.

Types of Cumulative and Secondary Impacts

The impacts of development on coastal and inland watersheds are well understood. Residential development often encroaches on previously undeveloped areas, resulting in loss of forest or other natural habitats, while the resulting pollution from stormwater, septic systems, fertilizer application, etc. leads to water quality impairment all along the coast. Likewise, urban sprawl leads to fragmentation of undisturbed lands, requires the development of supporting transportation infrastructure and other utilities, and increases energy demands.

With new development also comes increasing water demand, placing increasing stress on a finite amount of potable water resources and associated aquatic habitats. Approximately 84% of communities in Massachusetts have public water supplies. Of these, about 62% of the communities use groundwater as their primary water source, with the remaining 38% relying primarily on surface water sources. From 1994-2004, the number of public drinking water systems increased by 15% from 1486 to 1714. This demand for freshwater has led to impairment of coastal rivers (low flow and dissolved oxygen) such as the Ipswich, which has at time run dry during summer months. As a result of this increasing water demand, communities and state agencies in Massachusetts are revisiting stream flow, water conservation, and water consumption policies, and local entities are seeking alternative water supply sources, such as the construction of desalination plants.

Summary

Concerns over the rate, location, and type of new development point to a critical need to provide developers and municipalities with tools to ensure that the impacts of this development are minimal, and that there is a move away from traditional, high impact development practices. The remainder of this assessment and strategy is heavily focused on the development and implementation of low impact development tools, as well as methods for improved management of stormwater systems.

2. Identify areas in the coastal zone, by type or location, which possess sensitive coastal resources (e.g., wetlands, water bodies, fish and wildlife habitats, threatened and endangered species and their critical habitats) and require a greater degree of protection from the cumulative or secondary impacts of growth and development.

The cumulative and secondary impacts of new and existing development are well studied and understood and include impacts to both terrestrial and aquatic habitats. Loss of forested land, in particular, exacerbates water quality concerns by reducing the pollution removal efficiency of the landscape and adding pollution sources. Recent development trends raise particular concerns about sensitive wetlands and aquatic habitats

The table below contains more general examples of sensitive coastal resources and potential impacts from cumulative and secondary impacts.

Area	**CSI Threats/Sensitive Coastal Resources**
Coastal embayments	• Increasing impervious area • Failing stormwater infrastructure • Increased pollution sources: bacteria, nutrients, toxic contaminants
Coastal rivers, streams, and estuaries	• Increasing impervious areas • Stormwater runoff, hydrologic modification • Water withdrawal
Submerged aquatic vegetation	• Increasing impervious area • Land derived nutrient loading and sedimentation • Construction of coastal structures
Salt marsh	• Increased impervious area and stormwater runoff • Land derived nutrient loads • Hydrologic modification • Construction of coastal structures, docks, and piers
Areas of Critical Environmental Concern	• Various threats from development

Management Characterization

1. Identify significant changes in the state's ability to address CSI since the last assessment (e.g., new regulations, guidance, manuals, etc.). For each change, characterize the scope of the change, describe recent trends, and identify successes in improved management

Cumulative and secondary impacts from new and existing development continue to threaten the health of coastal habitats and water quality in Massachusetts. Nonpoint source (NPS) pollution resulting from intensive, traditional land use practices continues to be the leading cause of water quality impairment throughout the Commonwealth and around the country. Development pressure and antiquated zoning in

rural areas threatens unimpaired waters while cities and towns continue to struggle with the problems of an ageing stormwater infrastructure and attempt to remediate existing sources of pollution. In addition to water quality issues, water quantity is emerging as an area of concern for the Massachusetts Coastal Program. As freshwater sources of clean water are exhausted, the prospect of desalination of brackish and marine water is gaining increased attention as a tool for meeting increasing water demands. While promising, the appropriate sighting and operation of desalination facilities will require the development of sound policies and careful planning to minimize environmental impacts.

Massachusetts has made significant progress to address threats from cumulative and secondary impacts from development and resulting nonpoint source pollution over the last five years. Through the development and implementation of the Coastal NPS Management Plan, CZM and partner agencies have developed and implemented several smart growth tools and programs to aid municipalities and other organizations in assessing and managing land use derived water quality impacts. The assessment below provides a brief overview of the progress made to date and identifies new and innovative tools available to address cumulative and secondary impacts in coastal areas.

Coastal Nonpoint Pollution Control Program

Since 2001, several major new initiatives policies, and grants programs have contributed to CZM's knowledge of and ability to manage potential impacts to coastal resources from existing and nee development and associated site designs and land use patterns.

Two grant programs administered by CZM have supported the implementation of the Coastal Nonpoint Pollution Control Program: the Coastal Pollution Remediation Program (CPR) and the Coastal NPS Grant Programs. The CPR Program provides funding to municipalities in Massachusetts coastal watersheds to reduce stormwater impacts from roads, highways, or parking areas and to install municipal boat pumpout facilities. In 2001, the Coastal NPS Grant program was developed to complement CPR and address more general areas of nonpoint source control. These grants to municipalities, as well as other public and non-profit groups, have been used for the following types of projects: identification, and characterization of nonpoint sources; targeted assessment of the municipal stormwater drainage system (runoff from municipal roadways, parking lots, and bridges); the development of transferable tools (nonstructural best management practices), such as guidance documents, model by-laws, and land use planning strategies to improve nonpoint source control and management; and, the implementation of innovative and unique demonstration projects.

Just in a two-year period (2004 and 2005), the Coastal Nonpoint Source Pollution Grant Program Funded Projects resulted in new data, assessments and associated regulatory tools and management practices. Some accomplishments are as follows:

- Assessed, identified, and characterized nonpoint source pollution targeting bacteria and nitrates/nitrites within a sub-watershed of the Gulf River, South Shore; included a student-centered water quality assessment, analysis and research of NPS pollution control in the Gulf River, and an on-going public education and outreach program (speaker series, homeowner education tools, press articles); advanced the municipal mitigation strategies.
- Evaluated the sanitation practices for sewage disposal from recreational boats and commercial vessels within Salem Sound; produced a guidance document with concrete actions for changing behaviors and instituting improved practices and regulations to reduce illegal sewage dumping.
- Created a transferable Urban Stormwater and Low Impact Development Ordinance and a Best Development Practices Guidebook to give the City of Salem greater control over water quality (and quantity) by regulating drainage and stormwater runoff from construction projects smaller than one

acre and encouraging the principles of LID and smart growth. This project will serve as a model that can be easily transferred to other urban communities.

- Developed a "Storm Windows" program: a mass media/advertising campaign that "markets" stormwater as a significant problem that can be addressed by individuals; and includes partnerships with evening weather forecasters (which focus groups in Maine identified as an effective venue), targeted messaging, and community outreach including an interactive website.
- Developed a Greenscapes program, teaching consumers how to have healthy landscapes without using excess fertilizers, pesticides, herbicides, and water; including outreach to landscape professionals regarding integrated pest management, and groundwater protection, etc; created a Greenscapes marketing package distributed to the largest garden centers and nurseries in the region.
- Designed and constructed an urban Low Impact Development demonstration, including BMPS designed to minimize the adverse affects of development on riverine and coastal water quality will be implemented and evaluated by conducting water quality testing, and sampling the hydrology of the site post-construction
- Developed detailed stormwater drainage network maps and GIS data sets for several areas in the Buzzards Bay watershed to identify stormwater discharges and catch basins throughout 7 Buzzards Bay communities; also mapped an documented were underground drainage pipe system in several areas where these systems were previously unknown; the data was evaluated and used to established preliminary priorities for remediation.
- Analyzed nitrogen isotope ratios in shellfish in Martha's Vineyard coastal ponds which supported the theory that the ponds are being impacted by nitrogen from septic system wastewater in their watersheds;
- Assisted three municipalities in the lower region of the Merrimack River (one of the areas of Massachusetts with the highest rate of development) with the adoption and successful implementation of a proven, transferable NPS control tool, Open Space Residential Development (OSRD), this type of conservation subdivision permitting assisted the communities in reducing NPS pollution to coastal resources that typically occurs with traditional development practices
- Identified stormwater pollution as the major contributor to the high bacterial counts in Mill Creek, flowing directly to Sandwich Harbor. The town then designed and implemented structural best management practices to remediate this pollution in stormwater entering the creek
- Extensively enhanced capacity building to assist municipalities in coastal watersheds with NPS pollution control that generates from agricultural resources; as a result dozens of agricultural commissions were developed in coastal farming communities. These commissions worked cooperatively with local conservation commissions to ensure that NPS pollution information and resources are exchanged. Agricultural commissioners worked directly with farmers to evaluate farm contributions to nonpoint source pollution, and direct farmers to technical and financial assistance for remediating the problem.
- Develop a model transferable regulatory tool for implementing effective stormwater management, incorporating the concepts and principles of low impact design/development and conservation planning. The bylaw allows towns to have greater control of pollution impacts from new development, and guides their efforts in meeting state water quality standards.
- Provided a water quality monitoring service to a number of North Shore communities to assist municipalities in the development, and implementation of appropriate NPS management measures

Smart Growth Initiative

CZM has recently created a Smart Growth Coordinator position, a staff person shared with the Executive Office of Environmental Affairs (EOEA). The Coordinator launched an LID Working Group, comprised of 75 local, state, and federal agencies, conservation organizations, regional planning councils, watershed associations, and private development, planning, legal, and engineering companies. The LID Working

Group is a public/private partnership that promotes the acceptance and implementation of LID practices, and collaborates on projects and initiatives by polling technical and financial resources. Members of the Working Group have developed a series of LID guidance and design manuals, technical assistance fact sheets and case studies; brochures targeted to various audiences, and demonstration and assessment sites. As a partner, EOEA has developed an annotated LID model bylaw/ordinance.

CZM assisted EOEA in the development of the state's first water policy that both promotes wise management and efficient use of our water resources and provides a framework of principles, goals, and actions for managing water in Massachusetts. The Secretary of Environmental Affairs elevated LID implementation to a top priority in the water policy, and the newly formed Office of Commonwealth Development folded LID in the state's first new Sustainable Development Principles. CZM assisted EOEA in the creation of an LID webpage with principles, links, etc., and CZM developed its own set of Smart Growth webpages.

Since CZM partnered with Mass Audubon, the Mass Bays Program, and the Metropolitan Area Planning Council to develop a model Open Space Residential Design bylaw, 25 cities and towns have adopted the model. This bylaw provides a mechanism to minimize the impacts of development and protect open space when acquisition is not an option while at the same time providing equitability to developers.

EOEA has developed and produced a Smart Growth Toolkit that will assist municipalities in the implementation of new and innovative land use regulations and management practices. This toolkit will introduce 11 different smart growth techniques and include: a model bylaw, power point shows, case studies, brochures, and funding opportunities

CZM coordinates the Interagency Stormwater Working Group, primarily composed of state and federal agencies that have stormwater management regulatory and technical assistance responsibilities. The group shares data, research, and new initiatives, promotes agency coordination, and identifies stormwater management needs and solutions.

CZM has partnered with the County of Barnstable in supporting their compilation of existing municipal bylaw language that may be used by other coastal communities to more fully manage the permitting of docks and piers. These examples come from Massachusetts municipalities that have had success in balancing the varied interests associated with these structures.

Additionally, CZM staff has been working with the NOAA Coastal Services Center in the development of a dock & pier visualization program. This project is intended to add a visual component to the existing inventory of docks and piers law, regulation, and policy.
Through the use of Visual Nature Studio software, we plan to be able to create photo realistic 3D scenes and "fly-throughs" to illustrate the scenic, aesthetic and public access impacts associated with any future development of docks and pier growth, as compared to growth in a more managed, coastally friendly pattern. We believe that the project will provide managers at the local and state level with a needed educational / outreach piece to illustrate those impacts in an easily understood manner.

Executive Office of Environmental Affairs (EOEA)
To help communities reduce the future likelihood of sprawl and its associated nonpoint source impacts, EOEA sponsored the creation of a set of build out maps and analyses for all 351 cities and towns within the Commonwealth of Massachusetts. The maps and analyses depict currently developed and protected land within a community and what a community would look like if remaining undeveloped land were completely developed in accordance with local zoning. Given the home rule nature of Massachusetts land

use governance, EOEA thought it was critical to provide all 351 cities and towns this useful tool to explore growth and development planning. Every community from Boston to Mount Washington has an interest in its future and is part of the picture of growth statewide. The build out project allows every community to see its current and potential future development, and determine whether or not it is near build-out capacity.

These maps and analyses caused local officials to reflect on, give current zoning, the extent of possible growth into potentially preserved areas with high conservation values, the site designs that would either cause or mitigate resource impacts, and the percentage of impervious surfaces that would be introduced into the watershed causing stream bed stabilization and aquatic impacts. Although the municipalities were interested in changing this scenario, volunteer boards with a lack of technical expertise and escalating fiscal, did have the capacity or knowledge of what regulatory and management practices were need to reverse the growth trend.

Conclusion

*1. Identify priority needs or major gaps in addressing the programmatic objectives for this enhancement area that could be addressed through a 309 Strategy***.**

Development patterns based on conventional zoning codes in Massachusetts often result in "sprawl" with its associated large impervious areas, loss of natural areas, and alteration of hydrologic systems. Too often, the development process begins with the clearing and leveling of an entire parcel. Conventional developments, such as grid subdivisions, strip malls, office and industrial parks, contain wide roads and large parking lots. These large impervious areas prevent water from infiltrating into the ground (which normally replenishes groundwater supplies and supports nearby wetlands and streams).

To better manage water that runs off of these sites, structural stormwater controls such as catch basins, pipes, and detention ponds are used. Conventional landscaping of these developments brings additional concerns including introduction of non-native plants, use of herbicides, pesticides and fertilizers, and excessive water consumption.

Water resources in Massachusetts are under stress from existing sprawl development and further threatened by new development that is not designed to meet both economic and environmental goals. Several factors inhibit addressing change, especially the adoption of local regulatory and outreach strategies. Local officials and the development community are often unaware of the myriad of benefits from the use of innovative stormwater management techniques or their suitability for specific local circumstances. There is a general lack of knowledge of planning and outreach strategies to adopt regulatory measures, and in many cases, existing municipal regulations discourage or prohibit beneficial techniques. Local regulatory systems often constitute a barrier by penalizing or prohibiting best management practices such as cluster development or narrow streets. Information that might overcome these knowledge gaps exist, but it is too often overly general, anecdotal, or of uncertain relevance to conditions that exist in Massachusetts communities and geographic regions

Towns, developers, and landowners are becoming aware of and interested in using NPS best management practices. However, significant gaps remain in understanding the benefits and issues of specific techniques and the steps needed to implement them for best results.

The current focus in addressing the cumulative and secondary impacts of development is on providing municipalities with the tools to ensure that new and re-development projects have minimal impacts on coastal habitats and water quality. As described above, CZM has been working with partner agencies to

develop and implement principals of low impact development (LID) and assist towns in effectively managing stormwater to the maximum extent possible. Major gaps in LID acceptance and implementation by local governments and the business community are:

- Lack of awareness of basic concepts;
- Lack of understanding of benefits of LID versus traditional development practices;
- Lack of knowledge needed to translate concepts to local regulatory tools;
- Lack of technical design knowledge;
- Lack of Massachusetts's demonstration sites;
- Lack of Massachusetts based economic and environmental assessment data for LID practices; and,
- Lack of Massachusetts's web-based materials.

Many of these deficiencies also apply to stormwater management. Towns are not always aware of the most current and effective stormwater management options, do not understand how to properly site and design stormwater BMPs, or even identify stormwater management priorities. In addition to these limitations, funding is a major factor in determining a municipality's success in effectively minimizing runoff bourn contaminants to surface and groundwater. Many towns simply do not have the resources necessary to repair ageing stormwater infrastructure, maintain new BMPs, or conduct the necessary studies to identify stormwater hot spots. Filling these gaps are CZM priorities for real world, measurable change.

2. What priority was this area previously and what priority is it now for developing a 309 strategy and designating 309 funding and why?

Last Assessment: **Medium** This Assessment: **High**

In the last 5-6 years, CZM and its project partners have invested a great deal of staff time and funding in identifying top sources of non-point sources pollution and assessing the extent of the impacts to our coastal resources. The data confirmed that stormwater runoff from conventional development designs, with vast impervious surfaces, was a top contributor of pollution leading to the decline in coastal water quality and aquatic habitat.

To make real world change, Massachusetts's communities will have to change their sprawl regulations and planning practices and implement effective and innovative low impact development designs, stormwater management best practices and regulatory reforms. However, often municipal volunteer boards lack the technical capacity, funding capability, and expertise to develop the regulatory and outreach tools needed to ensure that development and redevelopment will better protect water quality and preserve land and water resources.

As described previously in this management characterization, CZM and its project partners have completed a comprehensive variety of model bylaws and outreach tools to assist communities with real world change. Concurrently, through, as sprawl threatens the fabric of these historic communities, cities and towns have become extremely interested in low impact development and stormwater management regulatory and guidance tools.

CZM believes that it is poised to introduce and gain acceptance for the implementation of the model bylaws and planning strategies, through an aggressive regional outreach program and the establishment of regional technical assistance teams which will assist the communities, after outreach, to make local regulatory changes.

We further contend that Massachusetts community officials are in desperate need of a web-based LID clearinghouse that will catalogue successful local case studies and have the capability to track project data, analysis, or deliverables, as well as link to all viable non-profit, state and federal programs resources. This website would also further promote collaboration and cooperation among state sister agencies.

In addition, CZM believes that it is essential to develop a technical manual that guides local officials through the process of identifying environmentally protective BMP and LID techniques for various residential and commercial scenarios with consideration to local technical capacity, political, and economic constraints. This is critical for communities to think "town wide" when planning and regulating, rather that site-to-site, reacting to each development as it comes through the process.

Cumulative and Secondary Impacts: Strategy

Program Change Overview

Several factors inhibit adoption of LID/BMPs: lack of awareness of the myriad of benefits from the use of specific LID/BPM techniques or of their suitability for specific local circumstances, lack of knowledge of effective strategies to adopt LID/BMPs measures, lack of information on the potential economic benefits of LID techniques, and in many cases, existing municipal regulations that discourage or prohibit beneficial LID/BMPs techniques. Information that might overcome these knowledge gaps exist, but it is too often overly general, anecdotal, or of uncertain relevance to conditions that exist in Massachusetts communities and watersheds. Towns, developers, and landowners are becoming aware of and interested in using LID/BMPs. However, significant gaps remain in understanding the benefits and issues of specific techniques and implementation step.

CZM believes that our program should now shift from scientific research projects to the cataloguing and dissemination of technical assistance tools and outreach materials to assist municipalities with implementation of new coastal LID programs, policies, and ordinances. This program change, in accordance with sections 923.80 and 923.84, will translate existing science into the effective regulatory models and viable guidance required for real world change.

Project 1: Establish LID/BMP Clearinghouse Website

Summary of Enhancement Tasks

A myriad of technical assistance and outreach materials, such as the Smart Grow Toolkit CD, Massachusetts LID DVD, 5 regulatory models, nine fact sheets, five brochures (for various audiences), "canned" power point shows, and funding sources have been completed. It is now time to introduce these technical and outreach materials to local officials, and promote the use of these tools to ensure local implementation of LID.

This project will begin development of a web-based LID clearinghouse that will catalogue successful local case studies; provide technical guidance to help local officials select and implement LID techniques, and have the capability to track project data and analysis. The primary audience consists of planning boards, conservation commissions, DPWs; consultants, watershed assns, developers, and resource managers.

The LID Working Group, Interagency Stormwater Advisory Group and CZM have developed or identified links to a plethora of Massachusetts' appropriate technical assistance, regulatory and outreach tools and materials on the internet. There is no one website that local officials can visit to retrieve this information. This clearinghouse housed on CZM website would not only store all this information, including real time progress, but provide a "snapshot" of the local projects through professional designed case studies. This website would promote the use of effective BMPs/LID but also reduce the likelihood of coast wide "reinventing the wheel", promote transferability, and forge regional partnerships.

Task 1: Research and catalogue past and existing successful LID/BMP projects, programs, and deliverables in Massachusetts

- Demonstration sites
- Assessments and Analyses
- Private and public installation sites - new and retrofits
- Outreach materials
- Bylaws and Regulations
- Technical Manuals
- Funding sources

Task 2: Develop case studies of successful installation projects and demonstrations sites; minimum of 5 each: urban; rural, and suburban; include discussion of challenges and how obstacles were overcome.

CZM will compile information on each of the 15 case studies mentioned above. CZM will develop and populate a consistent web template that includes, at a minimum, the following components:

- Development issue being addressed
- Selected technology and specifications
- Project scope of work and time line
- Anticipated benefits
- Real benefits
- Operation and maintenance requirements
- Economic information (cost of implementation and installation, cost of operation and maintenance, and associated cost savings
- Unanticipated benefits
- Lessons learned

Task 3. Assist Public Outreach Director and Graphic Artist with design layout and format for posting catalogued information and case studies on CZM website.

- Design LID logo
- Edit and revise all products
- Develop format for LID webpages
- Post on website
- Launch new web pages through various outreach methods (CZ Mail, press, etc.)

Project Appropriateness and Likelihood of Success

As growth and its associated nonpoint source impacts escalate, coastal communities rely on web searches for Massachusetts appropriate technical guidance, regulatory tools, outreach materials, and information about how other communities are implementing smart growth. CZM does not have available staff to create a catalogue database of

existing and proposed LID projects, programs, and initiatives across the state. This is important to reduce duplication in and increase transferability to coastal communities.

This project will assist in the protection and restoration of coastal water quality and aquatic habitat through greater use of LID practices and BMPs. This clearinghouse project will assist towns to understand how to best choose and use LID techniques and effective BMPs in a variety of land use designs and development scenarios throughout
their communities.

CZM anticipates this website to be very successful based on

- Dedicated staff time
- Outreach completed to date
  Proposed project was reviewed and approved by the LID Working Group
- The myriad of project partners
- The escalating demand for this product

Work Plan and Estimated Costs
Year 1 (10/05 - 5/06); $60,000 to carry out Tasks 1 and 2
Year 2 (05/06 - 12/06); $10,000 to carry out Task 3

Project 2: Technical Guidance for Development/Implementation of Stormwater Utilities

Summary of Enhancement Tasks
Communities in Massachusetts lack the tools and consistent funding necessary to maintain an aging stormwater infrastructure and meet the demands placed on stormwater conveyances and treatment systems by growth and development. This project will provide coastal communities with guidance and resources to develop an incentive based funding source for municipal stormwater management efforts and lay the groundwork for the adoption of municipal stormwater utilities (MSUs).

Task 1: CZM will work with a contractor to develop a tiered stormwater utility fee structure (and associated model by-law) that ranges from a blocked system of stormwater fees based on major land use categories to a fee structure based on development practices and associated impervious cover. The most progressive of these fee structures will include economic incentives (reduced fees) for the implementation of low impact development (LID) and other on-site stormwater management techniques that encourage groundwater recharge. A written report on these fee and credit systems will be accompanied by an appendix explaining the relationship between the proposed fees and credits and recharge rates of select BMPs and LID practices.

Task 2: CZM will work with a contractor to develop a model MSU plan. The plan will include guidance on the following:

- Identification of stormwater management priorities.
- Identification of resource needs (equipment, personnel, and expertise).
- Developing a stormwater infrastructure maintenance plan including street sweeping, catch basin cleaning, and BMP operation and maintenance.
- Identification of needs for stormwater retrofits and new treatment systems based on water quality and natural resource information (DEP Integrated list of waters, impaired shellfish beds, etc.).

Task 3: CZM will sponsor four regional workshops on the development of municipal stormwater utilities. The workshop will include

- An overview of state and local authorities as they relate to MSUs.
- An overview of the model stormwater by-law.An overview of model fee structures
- An overview of the model MSU implementation plan.

Project Appropriateness and Likelihood of Success
The time is right for MSUs in Massachusetts. The economics of stormwater management has emerged as a leading issue among state and local government, as evidenced by the July 2004 passage of stormwater utility enabling legislation at the state level (MGL Chapter 83, various sections), and the development of a model stormwater bylaw for three proactive South Coast Communities that contains a provision for establishing an MSU**.** Massachusetts towns are poised to take the next steps to implementing MSUs. The proposed approach to developing incentive based watershed management tools represents an innovative and economically sound method for advancing stormwater management at the municipal level.

Work Plan and Estimated Costs
Year One: CZM will with a contractor to complete tasks one and two ($60,000 for contractor services, $10,000 for printing and distribution costs)

Year Two: CZM will work with regional coordinators, the MassBays National Estuary Programs, and local partners to sponsor workshops on the North Shore, Metro Boston, South Shore, and Cape and Islands region. ($2,500 x 4 workshops = $10,000).

Programmatic Objectives

I. Enhance existing procedures and long range planning processes for considering the siting of public and private marine aquaculture facilities in the coastal zone.

II. Improve program policies and standards which affect aquaculture activities and uses so as to facilitate siting while ensuring the protection of coastal resources and waters.

Resource Characterization

1. Briefly describe the state's aquaculture activities.

The Massachusetts aquaculture industry is split between inland and marine culture. The primary marine species cultured in Massachusetts are quahogs (hard clams), and American oysters, To a lesser extent there are also some facilities cultivating soft-shell clams, bay and sea scallops and blue mussels. And on at an experimental level some work has been done with tautog, Atlantic cod, summer and winter flounder. Although 55% of the tidal and subtidal acreage used for shellfish cultivation if located in the Cape Cod region of Massachusetts nearly 80% of the industry's farm gate value is generated from farming in that region. Aquaculture in Massachusetts is estimated to generate around $10 million dollars farm gate value (USDA NASS), although as a result of suspected under reporting and sale of farmed product through traditional seafood markets, some estimate the industry actually generates 3-4 times more annually. Currently, although mandated by statute and regulation, aquaculture revenues from are reported to cities and towns with state-wide totals tallied by the Massachusetts Division of Marine Fisheries (DMF). Accordingly, it must be noted that accurate assessment of the economic value of aquaculture in this state has been problematic.

Shellfish culture is done both by individuals on a commercial basis and by towns for municipal enhancement of the wild shellfishery. In recent years, a few experimental offshore aquaculture facilities have come on line including a sea scallop facility (the first aquaculture structure nationwide licensed in federal waters) and a mussel rafting project, both located in Vineyard Sound. In recent years there has also been a surge of shellfish culture development on Massachusetts' North Shore including both municipal and private efforts focusing on steamer clam (*Mya arenaria*) production covering nearly 20 proposed or licensed acres of tidal flats. Following changes to the Model Ordinance of the National Sanitary Shellfish Program, allowing cultivation of shellfish to 10% of market size in waters where quality is classified other than approved (i.e. SA), there has also been growth in the nursery culture sector.

In Massachusetts and abroad there is also much research underway to identify alternative species and technologies that will facilitate off-shore aquaculture activity and although some projects have been proposed and some licensed, to date, there is no commercial offshore aquaculture in Massachusetts. Recent efforts to permit and develop "wind farms"off Massachusetts' coast have also renewed some discussion of supporting structures as platforms for the development of aquaculture facilities. But to date proposals have remained conceptual.

2. Environmental Concerns/Conflicts

Concerns and conflicts associated with intertidal shellfish culture have emerged as a result of a 1994 court ruling that, since aquaculture is more akin to agriculture, it is not fishing and thus not a protected public right under the public trust doctrine.

Considering the historically open access to marine resources that Commonwealth residents enjoy and the "exclusivity" requirements associated with the development of shellfish culture facilities, shellfish culture activities have come in conflict with other marine resource uses. Aesthetic issues have also impacted the establishment and operation of shellfish culture facilities; in actuality, however, during all but dead low tide the only aspect of the culturing that is visible are the navigational buoys that are required by state and federal statute and regulation for safety. At low tide, culture gear such as bottom trays, long line arrays and/or netting are visible.

Environmental concerns relating to shellfish bottom culture include the establishment of a monoculture which may reduce natural species diversity, possible entanglement in netting by birds and sea turtles, disease and genetic shifts in "wild" populations that may result from co-mingling of gametes from farmed and wild populations.

Although there are currently no "offshore" aquaculture facilities, issues pertaining to the development of these facilities have been suggested to include entanglement by marine mammals, particularly the endangered northern right whale, use of antibiotics, escapement of mobile species (e.g. finfish), introduction of exotic species, and impact on water quality and benthos.

In the spring and early summer of 2005, Massachusetts coastal waters bloomed with the toxic algae *Alexandrium fundyense (the so-called "red tide")* . This bloom eliminated the harvest of filter feeding shellfish from aquaculture operations from the New Hampshire border to Martha's Vineyard. The bloom resulted in a "state of emergency' and the seeking of a disaster declaration by the Governor of Massachusetts. Since the shellfish do not die and are eventually harvestable, aquaculturists did not qualify for Farm Aid Assistance. Economic impacts are difficult to measure and disaster aid documentation and distribution may be burdensome and difficult. As the bloom subsides, the algae changes into its cyst form entering the sediment, prompting fears of closure in future years. Persistence of the toxic algae into future years is probable and real. Additional conflicting uses may include recreational boating, commercial fishing, marine transportation, telecommunications and utilities siting, and naval activities.

Management Characterization

Implementation and Tracking of Strategic Plan

At the state level, CZM led the production of an Aquaculture Strategic Plan for the state that was released in 1995. While CZM took the lead in developing this Plan (utilizing 309 funds), it has by design been implemented largely by an interagency group led by the Department of Agricultural Resources.

Development of the Massachusetts Ocean Resources Information System (MORIS) MORIS is a multi-phased project to: 1) locate spatial and non-spatial data related to coastal zone management issues in general, and aquaculture in particular; 2) populate a database; and 3) provide tools for individuals and agencies interested in coastal management to access data.

Phase One began in August 1999 and was completed in December 2000. The initial application of MORIS was to develop relevant aquaculture data layers and to serve as a screening tool to select sites. CZM is training aquaculture extension staff and others interested in using this new tool. MORIS provides a major change in how prospective aquaculturists select sites and is intended to reduce time, cost and

frustration by centralizing important data. MORIS also represents a change in how CZM and other state agencies distribute ocean resource data and information.

MORIS is a 309 change and was funded for one year under Ocean Resources. Additionally, CZM has received funds to augment MORIS from NOAA's Aquaculture grant program. Since the first phase of MORIS has just been completed it is too soon to assess the actual effect of this change.

Aquaculture Outreach Programs

An outcome of the Aquaculture Strategic Plan is the increase in aquaculture education in secondary schools throughout Massachusetts. The Plan highlighted the need for aquaculture education for future aquaculturists, the public and also as an interdisciplinary tool for learning about science and math. The increase in aquaculture education has truly been remarkable. A network of aquaculture educators has been formed and received a multi-million dollar technology grant from the National Science Foundation. Over twenty school classrooms in Massachusetts have small recirculating aquaculture projects and a few others have access to small shellfish hatcheries and growout facilities.

The growth of aquaculture education programs is not a 309-funded change. However, the rising interest in aquaculture education is a positive sign for things to come and certainly will go a long way to increasing public understanding of this industry.

State support has allowed the establishment and continued development of a state-wide network of aquaculture technology assistance and support centers that have harnessed and enhanced already existing aquaculture expertise and have coordinated focused efforts on addressing industry needs. Accordingly, a number of successful efforts have been made to address biological as well as economic issues faced by Massachusetts aquaculturists. To that end work is underway to address disease concerns that have impacted shellfish aquaculture businesses, efforts with federal agencies have provided new programs that are aimed at minimizing risks associated with shellfish aquaculture and, most recently, the development and release of a Shellfish Aquaculture Best Management Practices (BMPs) and the concurrent development of state and federal incentive programs for BMP implementation have encourage the development of economically *and* environmentally sound aquaculture businesses.

Progress has also been made to simplify the permitting process for aquaculture facilities in Massachusetts. Beyond the establishment of a single point contact for aquaculture development, the Massachusetts Division of Marine Fisheries has developed new regulations for marine aquaculture development in Massachusetts. These regulations codify agency policies and provide better organization for the regulation and development of marine aquaculture facilities that are proposed for Massachusetts' coastal waters. It is expected that these regulations will attain final promulgation in early 2006.

Local Management Challenges

In Massachusetts, where by statute municipal regulatory agencies are the primary authorities for the establishment of aquaculture facilities, there are more deterrents than incentives for the development marine aquaculture facilities. Low fees for municipal licensure coupled with increased management responsibilities for municipal natural resource officers in addition to the fact that licensed shellfish growing areas are effectively removed from public access, are more apparent than the long term economic and environmental benefits that shellfish aquaculture facilities can provide municipalities. With this in mind, greater and more immediate benefits from the development of marine aquaculture operations must be provided if aquaculture is to realize its full potential.

Although some municipalities have taken a proactive approach toward the development of shellfish aquaculture facilities through the establishment and pre-certification by the State of "Aquaculture Development Areas" most have not. And considering again the limited incentives for shellfish aquaculture development, limited resources and technical expertise at the municipal level are often directed to other areas of more immediate concern or priority to municipal officials and citizens.

Conclusion

1. Identify major gaps in addressing the programmatic objectives for this enhancement area.

Although development of marine aquaculture has continued over the last 5 years including expansion of the industry to North and South Shore regions of the Commonwealth, broad acceptance and promotion of aquaculture businesses at the municipal level has not occurred. To address this major gap toward achieving this programmatic objective, support toward the development of "Municipal Resource Management Plans" that specifically address and include strategies for shellfish aquaculture development would facilitate planning for and development of aquaculture facilities. Fortunately a mechanism for the conveyance of such support already exists in Massachusetts General Laws (ch. 130 sec 20) that enables the Massachusetts Division of Marine Fisheries to provide funding to towns as a match/reimbursement to municipal aquaculture efforts. Unfortunately, budgetary constraints have limited the DMFs ability to provide this support to municipalities for more than a decade. Through the infusion of 309 supports, this program could be re-invigorated, providing incentives to public as well as private investment toward further aquaculture development in the Commonwealth.

As previously indicated, more than 4 years of work has resulted in the development and dissemination of Best Management Plans for Shellfish aquaculture in Massachusetts. Concurrently, incentive programs have been created at the State and Federal level that provide economic incentives for the implementation of BMPs. The USDA NRCS Environmental Quality Incentive Program (EQIP) provided $200,000 and the Massachusetts Department of Agricultural Resources Agricultural Environmental Enhancement Program (AEEP) provided $15,000. During the first year of that these incentive programs were available to shellfish growers in Massachusetts, they received a greater response from industry members than each program could address. Accordingly, support should be made available to enhance the AEEP program in effort to better address the need and opportunity to encourage environmentally responsible shellfish aquaculture practices.

2. What priority was this area and what is it now? Briefly justify the proposed priority ranking.

Last Assessment: **Medium** This Assessment: **Low**

While aquaculture is an issue that is not currently in the forefront in Massachusetts, CZM has historically played a critical role in planning for the issue and for mediating between competing interests, while not serving as a lead agency. CZM would like to keep a hand in this issue and some of the gaps identified above will receive periodic attention from our agency.

Section 309 Programmatic Objectives

I. Develop or revise programs that reduce the amount of marine/lake debris in the coastal zone.

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Marine/Lake Debris Characterization

1. Characterize the extent of marine/lake debris and its impact on the coastal zone.

Source	**Impact** (significant/moderate/insignificant)	**Type of Impact** (aesthetic, resource damage, etc.)
Commercial Fishing	Moderate	Resource Damage Aesthetic Public Health
Beach-Goers	Moderate	Resource Damage Aesthetic Public Health
Recreational Boaters	Moderate	Resource Damage Aesthetic Public Health
Shipping	Moderate	Resource Damage Aesthetic Public Health
Storm Drains	Moderate	Resource Damage Aesthetic Public Health
Illegal Dumping	Moderate	Resource Damage Aesthetic Public Health
Other Land-based	Moderate	Resource Damage Aesthetic Public Health

2. Explain any changes since the last assessment in the sources above, or their impacts.

A land-based source, plastic, has remained one of the leading types of debris that volunteers have collected over the 17 years of Massachusetts COASTSWEEP. In 1987, 84% of the trash and debris collected in Massachusetts was plastic. In 2000, the percentage was still a staggering 77%. Plastic items include many consumer items, such as bottles, food wrappers, drink containers, and plastic utensils. Plastic does not biodegrade and remains in the environment for extremely long periods of time.

3. Do you have beach clean-up data? If so, how do you use this information?

COASTSWEEP, Massachusetts' annual volunteer beach cleanup program, is part of an international campaign organized by The Ocean Conservancy in Washington, DC. As in Massachusetts, participants all over the world collect marine debris and record the types of material they find. This information is then used by the Ocean Conservancy to help reduce future marine debris problems. Each fall, cleanups are held all along the Massachusetts coastline. Volunteers can join scheduled cleanups or organize their own cleanup. Sponsors provide all necessary materials.

Management Characterization

1. *For the categories below, identify significant state ocean/Great Lakes management programs and initiatives developed since the last Assessment:*
    - *State/local program requiring recycling*
    - *State/local program to reduce littering*
    - *State/local program to reduce wasteful packaging*
    - *State/local program managing fishing gear*
    - *Marine debris concerns incorporated into harbor, port, marina, and coastal solid waste management plans*
    - *Education and outreach programs*

In 2002, Executive Order 438 was signed by former Governor Jane Swift and established the Massachusetts State Sustainability Program. This Program is working to ensure that state government remains in compliance with all environmental laws and regulations, while serving as a model by promoting sustainable practices that reduce the state's environmental impact and save taxpayer dollars. It highlights recycling/waste reduction as one of the top priorities of the State Sustainability Program, with the specific goal of achieving a 50% recycling rate in state government by 2010.

In FY03 the State Sustainability Program contracted with several recycling service consultants to conduct site visits and make recommendations for increasing recycling and decreasing solid waste costs at a variety of state facilities, including college campuses, state hospitals, and Logan Airport. Fitchburg State College and Massachusetts College of Art and UMass Medical Center were among the participants. These reports and others can be found at: http://www.mass.gov/envir/Sustainable/reports/recycle/higher_ed.htm.

Further, the Massachusetts Department of Environmental Protection (DEP) has developed a website for recycling, waste prevention, and related information and guidance for residents, businesses, municipalities, and citizens throughout the Commonwealth. The site includes: a listing of vendors who accept, collect or purchase recyclable materials from Massachusetts communities and businesses; information on resource management for businesses, institutions, and municipalities to reduce waste, increase recycling, and lower disposal costs by providing their solid waste contractors with clear financial incentives for managing resources in economically and environmentally responsible ways; organizations that promote recycling and provide technical assistance; fact sheets and funding sources to promote public education on recycling; and other viable resources (http://www.mass.gov/dep/recycle/recycle.htm).

2. *For changes identified above provide a brief description of the change:*
    - *Characterize the scope of the change*
    - *Describe recent trends*
    - *Identify impediments to addressing the change*
    - *Identify successes*

In the last assessment, education was highlighted as a major programmatic gap in marine debris. Each change or program above aims to reduce land-based sources, the most common marine debris, and each aim to do so by educating the public, state, or locality. Anecdotal evidence has indicated a decrease in debris found on the beaches each year; an increase in the state's recycling efforts can only be a contributor.

Conclusion

1. Identify priority needs or major gaps in addressing the programmatic objectives for this enhancement area that could be addressed through a 309 Strategy.

The major gap in addressing programmatic objectives for marine debris is lack of data. COASTSWEEP is conducted by volunteers once a year in Massachusetts. Unfortunately, not all volunteers complete the data cards provided at this event. Also, other states participate in a spring COASTSWEEP. Massachusetts does not participate at this time; but, with more help from our event sponsors, this option may be available in the future. In addition, other variables, like the weather, affect the number of monitoring sites and volunteers from year to year.

2. What priority was this area previously and what priority is it now for developing a 309 Strategy and designating 309 funding and why?

Last Assessment: **Low** This Assessment: **Low**

State efforts have been focused primarily on educating the public on marine debris problems. A significant investment of resources would be required to observe any measurable changes. Given the limited availability of resources, when compared to the priorities of other 309 categories, any expenditure would quickly surpass the realized benefits. The priority level therefore remains low; therefore, no Strategy is proposed.

Major Accomplishments Under 309 Funding (FY2001– FY2005)

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- **Update historic shoreline change maps.** This data is available on-line to provide decision makers, property owners, and other interested parties with more recent information and robust statistical basis regarding shoreline trends in Massachusetts.
- **Re-delineation of Velocity zone boundaries in sand dunes in coordination with the Federal Emergency Management Agency (FEMA).** Many areas of dune that FEMA regulations state should be considered V zone are currently mapped as 'C' or 'X' zones (i.e., located outside the 100-year floodplain). Based on our work in Gloucester, Salisbury, Newbury, Newburyport, & [12/28: left voicemail for Dan Sampson for other municipalities to include here.], the landward extent of the V zone in some cases will be moved 50 to 200 feet further landward when the FIRMs are updated.
- **Analysis of repetitive loss properties to document correlations between frequently damaged properties and a range of coastal process parameters.** Our analysis indicates that the highest concentrations of repetitive loss properties occur in relatively low-lying areas in or adjacent to coastal beaches and dunes, and along northeast facing shorelines exhibiting highly altered landforms, and concentrated development.
- **Initiate a seagrass quality assessment program and a long-term monitoring program for near shore vegetated habitats** by establishing six fixed monitoring transects in Salem Sound to evaluate monitoring approaches for eelgrass habitat. Monitoring was conducted from 2003 to 2005.
- **Development of a habitat suitability model for eelgrass (Zostera marina).** The suitability model was tested for the Annisquam River and Gloucester Harbor and provides the basis for restoration and conservation planning (Completed via contract with the University of New Hampshire).
- **Complete the first of a three-part series of investigations into trends of estuarine marsh** at four time intervals: 1893, 1952, 1971, and 1995. The first study focused on Boston Harbor, Cape Cod, Nantucket, Martha's Vineyard, and the Elizabeth Islands (Conducted by CZM, the US Fish & Wildlife Service, and University of Massachusetts's Natural Resources Assessment Group).
- **Partner with Massachusetts Department of Conservation and Recreation to create the Area of Critical Environmental Concern (ACEC) Stewardship Guide**, a web-based resource of contacts, planning tools and maps. This Guide provides a cost-effective way to promote education, outreach, technical assistance, and program implementation throughout all coastal ACECs. To view this Guide, logon to: http://www.mass.gov/dcr/stewardship/acec/acecGuide.pdf
- **Complete new ACEC Resource Management Planning Guidelines and distributed to coastal communities.** Resource management plans (RMPs) are one of the tools that help communities identify and prioritize issues, projects, and partnerships for sustaining the natural and cultural resources in an ACEC. The Guidelines can be found at: http://www.mass.gov/dcr/stewardship/acec/rmp_guidelines.pdf
- **Launch the Massachusetts Ocean Management Initiative and Ocean Management Task Force.** Key achievements in this program include: publication of *Waves of Change: The Massachusetts Ocean Management Task Force Report and Recommendations* and the accompanying *Technical Report*; filing of a statewide comprehensive ocean management statute; managing interagency meetings regarding an ocean plan; assisting with the revision of finfish aquaculture regulations; establishing the State Marine Protected Areas Working Group (April-October 2005); establishing and maintaining the Seagrass Technical Team (2002-ongoing); establishing and maintaining the Aquatic Invasive Species Working Group (2000-ongoing); and developing the Massachusetts Ocean Education Guide. For more information on the Ocean Management Initiative, please view: http://www.mass.gov/czm/oceanmanagement/

- **Initiate a program to demonstrate the value of monitoring and management at a variety of scales** to support the development of management strategies to conserve estuarine and marine habitats and initiate ecosystem-based planning (Supported in part by 309 funding).
- **Develop a statewide Dredged Material Management Plan (DMMP)** to manage contaminated dredged material in Gloucester, Salem and New Bedford Harbor and characterize resources in Buzzards Bay in support of the designation of the Buzzards Bay Disposal Site. DMMP projects were largely funded through the Massachusetts SeaPort Bond.
- **Publish a technical report that provides the first description of the marine and human environment in Gloucester Harbor in over 30 years** (*Gloucester Harbor Characterization: Environmental History, Human Influences, and Status of Marine Resources*).
- **Play an integral role in regional governance coordination,** including participating in the Gulf of Maine Council on the Marine Environment, New England Fishery Management Council, Gerry E. Studds Stellwagen Bank National Marine Sanctuary, the Buzzards Bay and Massachusetts Bay National Estuaries Programs, and Northeast Regional Aquatic Nuisance Species Panel.
- **Create the Massachusetts Ocean Resources Information System (MORIS)** to manage and distribute data relating to ocean resources.
- **Prepare a report documenting the energy sectors, infrastructure, and transmission/transportation, as well as the regulatory framework for energy uses and infrastructure.** This report focuses on the energy uses and activities in the Massachusetts coastal zone and places these issues into a wider, state-wide context. This report provides useful background and descriptive information regarding the presence of energy facilities in the coastal zone.
- **Complete development of a GIS-Database known as the "State Register of Protected Coastal Accessways"** and a field inventory of all publicly accessible waterfront properties owned by federal, state, and local governments as well as non-profit conservation organizations in the state. (Portions of this collection are available in *The Massachusetts Coast Guide to Boston and the North Shore* (2004) and on the internet as part of the online Mapping Service provided by the MassGIS Program.)